WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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A DRESSING CHEST, WITH JEWEL DRAWERS AND GLASS ATTACHED.

BY A. TISCHLER.

FOR a small bedroom it would be difficult to name a more useful or economical piece of furniture than that known as a dressing chest. It unites in itself all the advantages of an ordinary dressing table and of a small chest of drawers, without occupying more floor space than either of them separately. In regard to cost, also, though more expensive than one or the other, it is less than the two of them. Fig. 1 represents a dressing chest of a good plain style—just such a thing, in fact, as a house furnisher would consider useful stock, and therefore commendable to those readers who are cabinet-makers by trade. By amateurs the design will no doubt be appreciated for its simplicity, as anyone who can make a drawer will experience no great difficulty in making this piece of furniture. The wood of which it is to be made must, of course, depend on the choice of the customer or the maker, as the case may be, as any of the ordinary furniture timbers are equally appropriate.

Those of our readers who contemplate making it for stock may be reminded that ash, American walnut, and mahogany are the woods most in vogue for bedroom furniture, so that, if made of any of these, it will be better stock than if some more unusual wood were selected. If made for any particular room, of course the furniture in it will determine the choice.

Now, bearing in mind that the chest is to serve as a dressing table, it will not do to make it of the same height as an ordinary large-sized chest of drawers, for such a height would be inconvenient to most people. If made ordinary table height, it will be much better, and this may be taken as 2 ft. 6 in., or rather more.

The width across the front may be taken as 3 ft. 6 in., though nothing definite can be said about this, as there is, naturally, much latitude allowable. It may, however, not be amiss to say that anything over 4 ft. would be unusually large. It must be understood, therefore, that any measurements of jewel boxes and glass to be given subsequently apply only to a 3 ft. 6 in. chest, and may be modified according to circumstances.

Fig. 1.—A Plain Dressing Chest, with Jewel Drawers and Glass attached.

For any size under 3 ft., jewel boxes are hardly desirable, as either they or the glass would have to be made inconveniently small. If something in the nature of a jewel drawer be required, one drawer immediately under the glass, as represented in Fig. 2, is a very suitable arrangement. Of course, if preferred, the top of the chest may be left plain, without either boxes or glass attached. In such a case it should have a small slip of wood along the back of the top to serve as a guard to prevent things slipping off.

The depth of the top from back to front may be taken as 1 ft. 9 in., so that if it overhangs about an inch at both back and front, the widest or upper portions of the ends will be about 1 ft. 7 in. It should be observed that the overhang of the top should be the same at the ends as in front, and that it should be rather under than over 1 in. At the back the overhang may be anything in reason.

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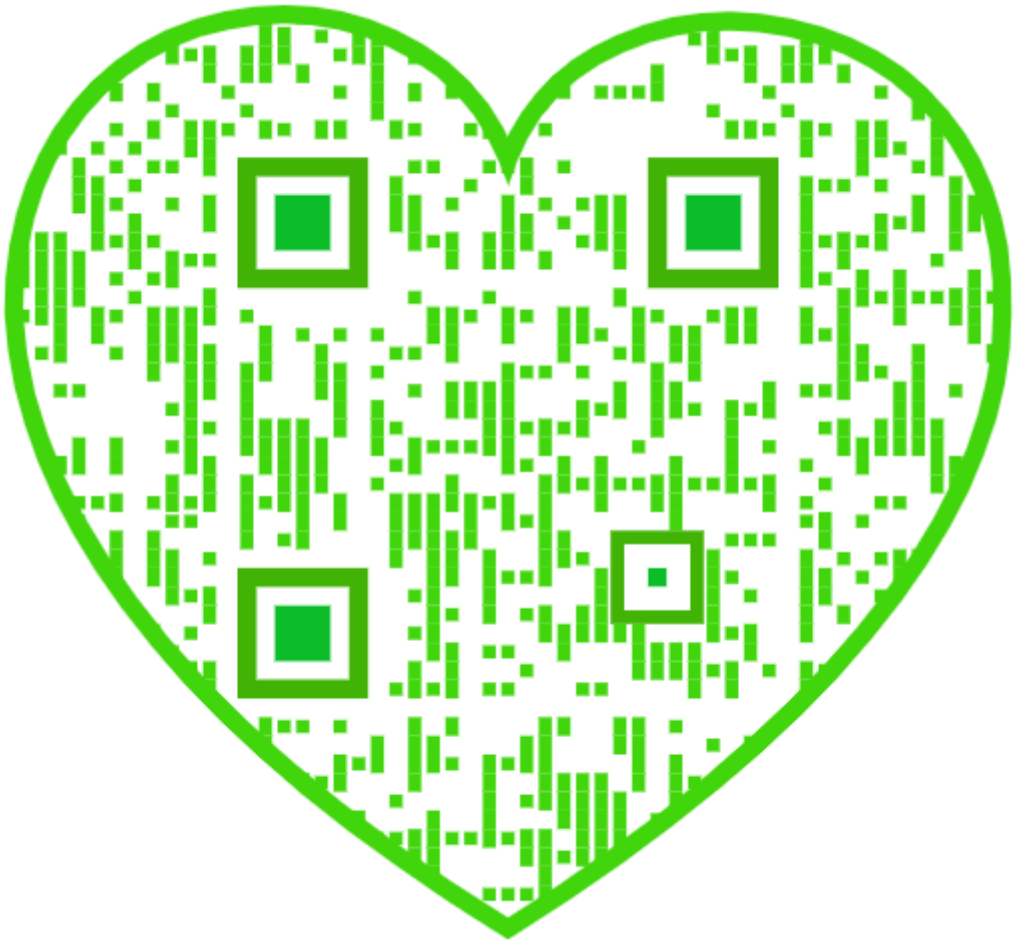

The narrower part of the ends may be from 2 in. to 3 in. less than the wider. The extra width is got by simply jointing on pieces of the necessary size to the main portions of the ends. As many readers are no doubt aware, dressing chests are often made without the projecting upper drawers, or, in other words, the ends are of the same width throughout. There is no reason why they should not be by those who wish to economise their labour, but in the opinion of most, the improved appearance gained by having the widened top will more than compensate for the trifling additional amount of labour involved.

The following measurements may be taken for the jewel boxes: Width across front, on top, 11 in.; back to front, 8 in.; and height, 5 in.

These measurements will allow of a silvered plate measuring about 2 ft. 2 in. by 1 ft. 4 in. sight size.

Very little need be said about the actual details of construction, but a few hints to those who might otherwise find themselves "all at sea" may not be amiss. The articles entitled "Lessons from an Old Bureau" in Vol. I. of WORK will give novices nearly all the information they require, and, if they have not already done so, they will do well to study them.

In making the dressing chest, the ends may be of ¾ in. or 1 in. stuff, and the top the same. The fronts of the ends are shown thickened up with pilasters to about 2 in. The ends and top of the jewel boxes need be scarcely so thick as the corresponding parts of the lower portion. It is, it may be presumed, understood that the jewel boxes are made independently, and are screwed through their bottom boards to the top of the chest.

The length of the turned columns (which are shown on a larger scale than in Fig. 1 by Fig. 3) must, of course, depend on the length of the glass, which is attached to them by means of the ordinary "glass movements." These should be fitted so that the part of the glass below them is heavier than that above them. The movements are fastened to the square portion of the columns, and to the corresponding parts of the glass frame. Let it here be said that common, low-priced movements are a nuisance, as they are so liable to get quickly out of order. Nothing so surely detracts from the appearance of even the best cabinet work as inferior brass fittings, unless it be bad polishing.

A few suggestions for modification and alterations from the original design may now be given:—

The tops, instead of being plain chamfered, may have the edges moulded and lined up, as shown in Fig. 4. If this finish be adopted, the upper edge of the plinth should be treated in the same manner, to keep up the uniformity of the design.

The fronts of the drawers, instead of being plain-beaded across, may have sunk bevels at the edges, as represented by Fig. 5. As the difference between a sunk bevel and a plain one, which would not look well, may not be known by all, they are shown in section in Figs. 6 and 7 respectively.

A rich appearance may be given to the drawer fronts by planting mouldings round their edges, as suggested by Fig. 8. The moulded drawer fronts should be set back further than they otherwise would be, so that the moulding is flush with, or only a trifle within, the bearers.

The edges of the bearers themselves may have moulded edges, as represented in Fig. 9, in which case the drawers must be set still further back. Beads may be run across the drawers just as if they were without mouldings, but, of course, before the mouldings are put on. The edges of the glass frame may also be moulded to correspond. By the way, if the slight extra cost be not objected to, the glass should have bevelled edges. A ¾ in. bevel will be quite sufficient for such a small plate. When measuring the size of the glass, be careful to take sight size, and not the full within the rabbet. If, when ordering the plate, sight size be clearly expressed, the glass merchant will understand that it must be a little larger, and will probably allow ⅜ in. in each direction. This is the usual way, and, of course, the purchaser may order it plate size if he prefers.

Instead of the narrow guard which is shown in Fig. 1 at the back of the jewel drawers, a more ornamental appearance may be given by means of a row of spindles, as shown in Fig 10. The spindles should not fit directly into the tops of the boxes, but into a rail placed on them; and in character they should be similar to the larger columns. Being so much smaller, no attempt should be made to have the same number of members.

Instead of being hung on columns, the glass may be placed on brackets, for which suggestions are given in Figs. 11 to 13. If brackets are used, they should be firmly secured to the jewel boxes, otherwise the weight of the glass is apt to work them loose. The carving shown on Fig. 13 is very slight, and may be omitted if preferred, or something similar used in either of the others.

The top rail of the glass may appear to some as being rather too plain, and they may, perhaps correctly, think that the appearance would be improved by the addition of something. This may either be a row of spindles, as suggested for the backs of the jewel boxes, or a pediment, of which three shapes are shown in Figs. 14 to 16. Carving may be introduced into any of them, though they will look well plain. Two drawers instead of one may be in each jewel box.

It merely remains to end these few suggestions with a word of advice to both amateur and professional makers—viz., do not forget to prepare a full-sized working

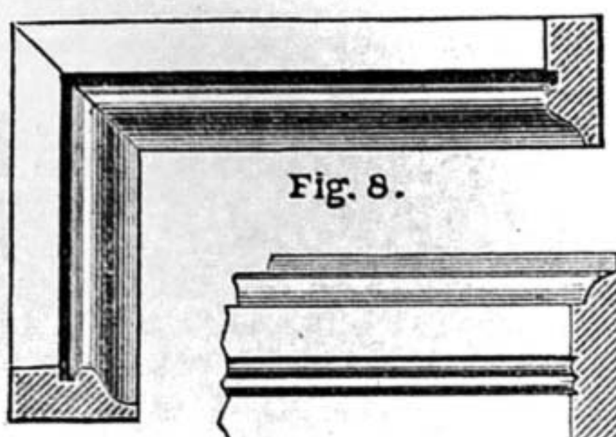

Fig. 8.

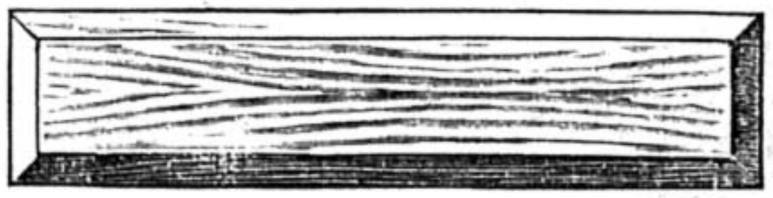

Fig. 5.

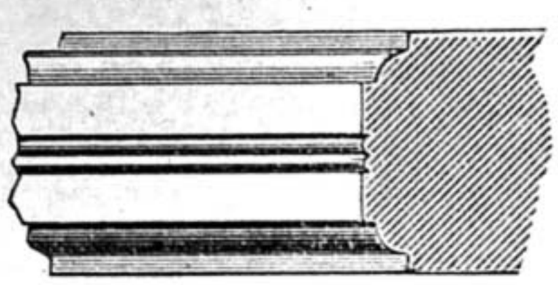

Fig. 9.

Fig. 3.

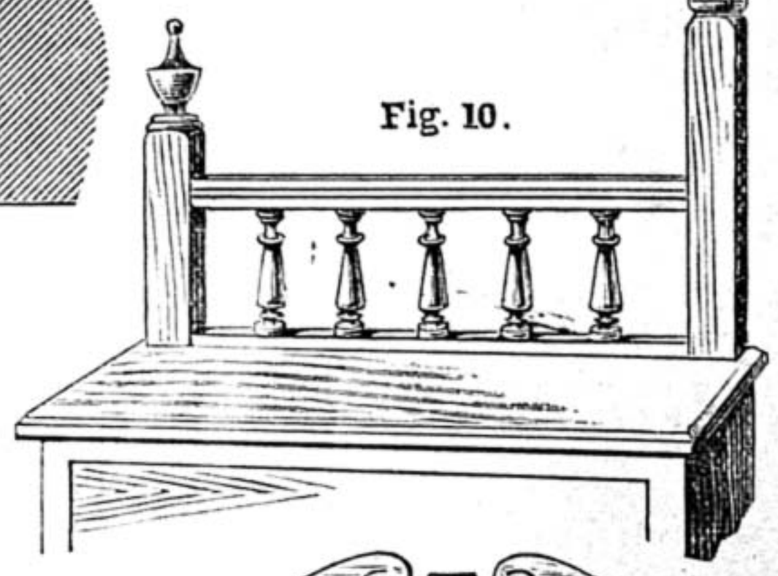

Fig. 10.

Fig 6.

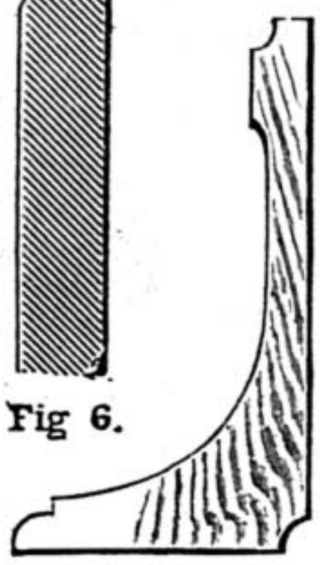

Fig. 11.

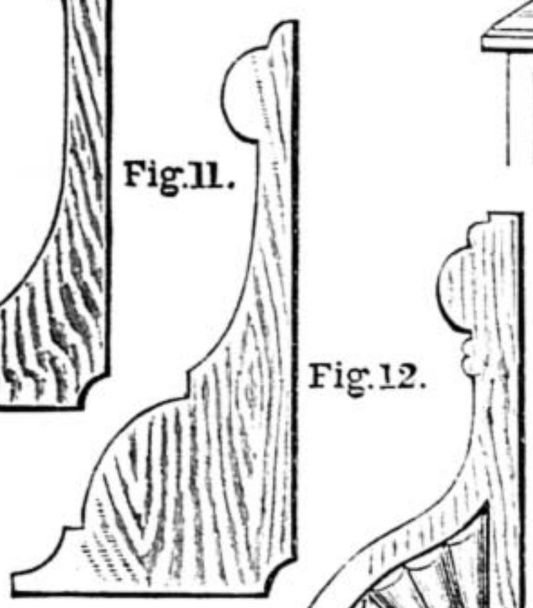

Fig. 12.

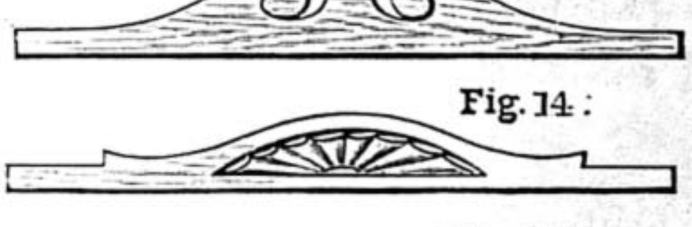

Fig. 14.

Fig. 13

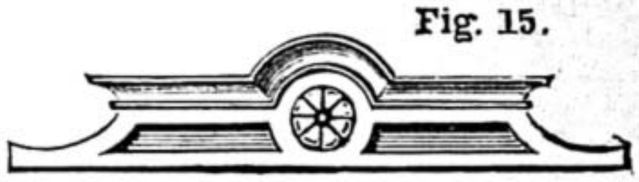

Fig. 15.

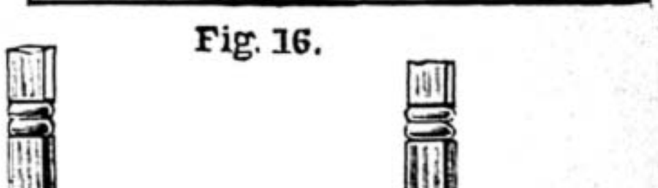

Fig. 16.

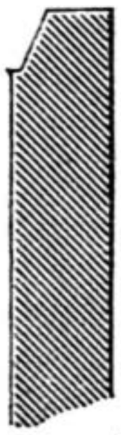

Fig. 7.

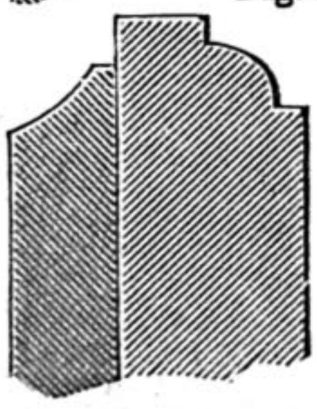

Fig. 4.

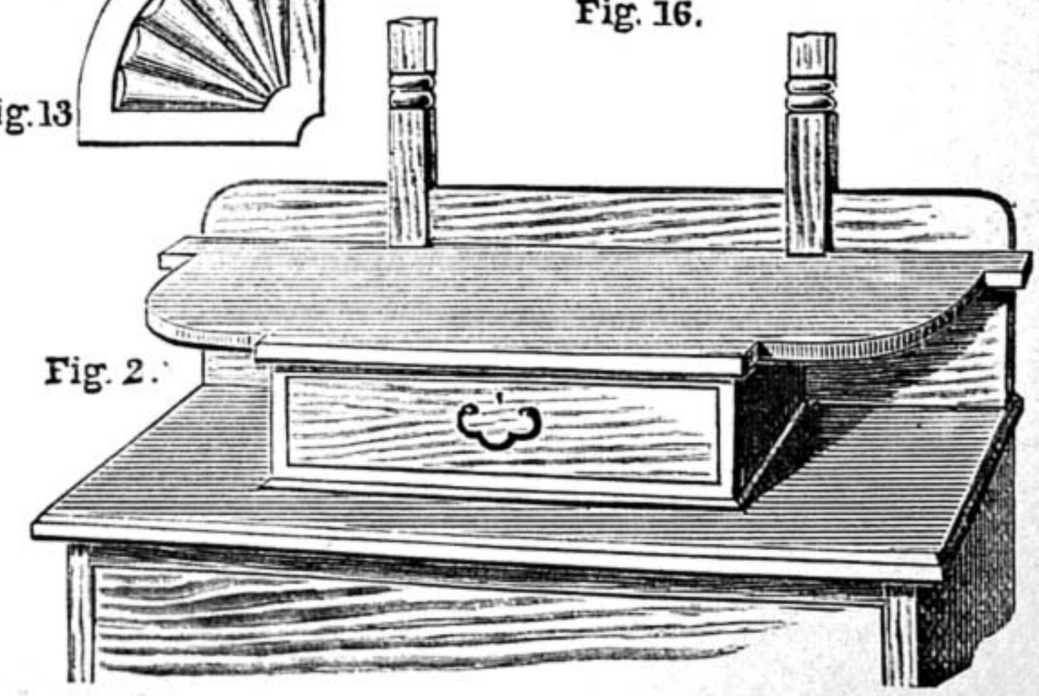

Fig. 2.

Fig. 2.—Jewel Box for Small Chest. Fig. 3.—Members of Turned Column. Fig. 4.—Moulded and Lined-up Top. Fig. 5.—Drawer with Bevelled Edges. Fig. 6.—Edge with Plain Bevel. Fig. 7.—Edge with Sunk Bevel. Fig. 8.—Moulding round Drawer Front. Fig. 9.—Alternative for Edges of Drawer Bearers. Fig. 10.—Spindle Gallery at Back of Jewel Boxes. Figs. 11, 12, 13.—Brackets for Glass Standards. Figs. 14, 15, 16.—Pediments.

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drawing as the first step towards making a dressing chest, or, for that matter, any other piece of furniture.

HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

SUPER CLEARER, BEE TRAP, DRONE TRAPS.

THE super clearer recently invented by the celebrated expert, Mr. W. B. Webster, of Binfield, will be found a most useful piece of apparatus, and certainly deserves a description in these pages. As its name implies, it is designed to free the super, when full of honey, from the bees which lurk among the combs. It is not always an easy matter to take a super full of honey from a stock of bees. The removal of the super and substitution of a quilt is easy enough, but when the super is found to contain thousands of bees as well as their honey, the novice is sometimes rather exercised in his mind as to how to get rid of them.

If, however, Webster's super clearer is slipped between the brood nest and the super, ten or twelve hours before the latter is removed, it will generally be found that very few bees, if any, are to be met with among the sections. The crate can thus be taken off without the slightest disturbance of the bees, the capped sections removed, and new sections with foundation substituted. All this without a host of bees buzzing about the manipulator and the section crate! Surely a super clearer is a very desirable acquisition!

It is a very simple piece of work, on the same principle as the well-known mouse traps, into which the mice go through a tunnel formed of wires converging towards the inside of the trap, while exit is prevented by the points of the pieces of wire. The clearer or trap proper is fixed into the centre of a board which is made to fit between the brood nest and super.

We will first proceed to make this board. For the hives I have described in this series, the board should be 17 in. square and $\frac{1}{2}$ in. thick, of perfectly dry yellow pine, and planed true and not in winding. For other hives the thickness will be the same, but the other dimensions must vary, the object of the maker being to have it completely cover the frames, so as to prevent the escape of the bees.

Strips of wood, a bee space in thickness, viz., $\frac{5}{16}$ in., must now be tacked round the board at both sides. This will increase the thickness of the board at the edges to $1\frac{1}{8}$ in. while the centre will remain $\frac{1}{2}$ in. These strips may be about an inch in width more or less.

In the centre of the board a hole 5 in. long and 3 in. wide is cut, as seen in Fig. 1. This can easily be effected by boring holes with a centre-bit at the corners, and sawing between them with a keyhole saw. Fig. 1 shows the board at this stage, with slips round the edges and hole complete.

We now turn to the trap proper, which is not so easy to describe. It is made of stiff wire netting about twelve meshes to the inch, but I should say any stiff wire netting whose wires are not more than an eighth of an inch apart would do. A piece 4 in. long and 3 in. wide will make one trap. It should be cut to the shape shown at Fig. 2, the middle portion being partly severed from the ends or wings at each side as shown.

A tapered piece of wood, such as the handle of a small paint brush, should now be procured, and the ends of Fig. 2 doubled over it so as to make each end a kind of circular tapered tunnel. Another piece of wood, like the handle of a broom, $1\frac{3}{8}$ in. thick, should have its end cut off square. This end should then be placed in the position of the dotted line in Fig. 2, and the sides in Fig. 2 turned up against the sides of the broom-handle. The netting is thus made into a receptacle which is not unlike Fig. 3. The bees can get in underneath, which is open, and would pass along the tunnels, emerging at the points which are not more than a quarter of an inch across.

Two pieces of tin or zinc are now procured, each 6 in. by 4 in., and an inch and a half hole bored in the centre of one, and a seven-eighth hole in a similar position in the other.

These centres may be found by joining the opposite angles of the tin. The trap (Fig. 3) is now to be taken, and the lower part, which was formed over the broom-handle, can, with a little manipulating, be made to pass through the $1\frac{1}{2}$ in. hole in the tin; then the edges are turned back and the trap thus secured to the tin.

The other piece of tin can now be laid over it, and the jagged ends of the wire netting will thus be covered over and hidden. The trap and pieces of tin may now be inverted over Fig. 1, the trap passing through the hole, axially with it, and in its centre, and tacks through the edges of the tins will secure it in place. Instead of this, other strips of tin or zinc three-quarters of an inch wide may be tacked round the edges of the two tins, and will serve to keep them from moving.

A description of the complete affair, as it lies before me now, will probably help the amateur. Looking at one side, I see a board 17 in. by 17 in. with a slip $\frac{5}{16}$ in. high and 1 in. wide tacked all round. In the middle there is a piece of zinc 6 in. by 4 in., held in place by other strips all round tacked to the board; there are just two dozen tacks, spaced about an inch apart.

In the centre of the zinc there is a circular hole $\frac{7}{8}$ in. across, and looking through I can see the wire netting and the tunnels leading towards each end. Looking carefully through the hole, I can see the ends of the wires of the netting turned over a second piece of zinc, the zinc at my side covering the jagged wire ends.

Turning the board over, I find strips round the edges at this side as well, a bee space high, and an inch wide. Instead of the zinc, I notice a hole like that shown in Fig. 1 in the middle of the board, the zinc of the other side acting as a bottom to this hole. In the centre stands the trap, made of wire netting like Fig. 3. The middle of the trap is an eighth of an inch lower than the surface of the board, but the tunnels slope upwards, and their points are an eighth of an inch higher; the points of the tunnels are equidistant from the ends of the hole. On a careful examination I observe that a bee could not by any possibility get from this side to the other except through the tunnels, and as the ends of the wires are unprotected and only $\frac{1}{4}$ in. apart, she would not find it comfortable, if it would be even possible, to go from this side through. In the opposite direction the passage would be easy enough.

It is scarcely necessary for me to add, as I am sure it is evident to the intelligent bee keeper, that the clearer should be placed on the hive with the trap side down, and the zinc side up towards the section rack, thus affording all opportunity to the bees of leaving the super, but none of returning. It would be wise to write "this side up" on the zinc side of the clearer.

If one of these super clearers is not used, it would be well to make a bee trap for the express purpose of ridding the supers of bees after they are taken from the hives. A box should be made of half inch wood large enough to hold the crates and a little over. As our crates are 17 in. by 17 in., a box 18 in. square and 6 in. high inside measurements would be enough. This should be well made—as nearly as possible light tight. The top should have a flange all round to fit over the body and break the joint.

Towards the upper edges of the sides a number of $\frac{1}{4}$ in. holes should be cleanly bored with a centre-bit, and through these the bees can escape. To prevent entrance, however, some precaution must be taken, but this can be done very easily by utilising the old five-pin bee trap.

Draw with a fine pencil a line horizontally across each hole, passing through its centre as at Fig. 6, then drive four pins into the sides of the box, two above and two below this line, and sloping upwards at a small angle; then lay another pin between them across the hole, which it will serve to bar. The bees from the inside can easily push the pin forward out of their way, but it will drop back as soon as the pressure is removed, and effectually prevent entrance to the box. When in use, the box should be placed so that the sun can shine through the holes, which will cause the imprisoned bees to make for the light.

A drawback to this plan is that when the bees find themselves separated from their companions they are tempted to gorge themselves with honey to prepare for emergencies, and with that object in view they pierce the cappings of the sections, which take away considerably both from their value and from their keeping qualities. The super clearer, however, is not open to this objection, the bees not being separated from the hive, or otherwise disturbed to any extent.

Drone traps next demand our attention, of which I will describe two. The simplest (Fig. 7) consists of a piece of excluder zinc bent in such a way as to completely cover the entrance to the hive. One could be made of a piece of excluder 1 ft. long and 4 in. wide as follows:—Call one long side the front; from two of the front corners cut out pieces 2 in. long and 1 in. wide; then turn down the piece in front, which is 8 in. long and 1 in. wide, between the pieces which have been cut out; turn down also the ends, which will be 2 in. long; and then turn out 1 in. at each end. It will then be like Fig. 7, and complete. If it is placed at the door of the hive in the middle of a fine day, when the drones are flying freely, it will entirely prevent their entrance; and a crusade might be made against them late in the evening. Of course, care should be taken that the trap fits closely against the front of the hive, so that there is nowhere a larger space for the entrance of the bees than the perforations in the zinc; otherwise the trap might be set in vain.

This is at the best a negative kind of trap: it does not quite catch the drones, but simply prevents them from entering their home.

Fig. 8 is the section of a drone trap which catches and retains the drones until the bee

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keeper has leisure to get rid of them. The part to the left of the engraving is placed against the hive entrance in the morning, and the drones on going out for their airing follow the direction of the arrow. The bent part (E) is made of the excluder zinc, so they cannot gain exit through that. They then crawl up along the sides D, D, through the narrow space on top, only to find excluder zinc above them and in front. They have not wit enough to regain the hive through the narrow entrance between D, D, and so remain buzzing in the top space until the bee keeper puts them out of their misery. The worker bees make easy exit through the excluder zinc, which forms the top, front, and arched bottom of the trap.

To make this trap, we will require a piece of nice straight-grained yellow pine, 3 ft. long, 9 in. wide, and ½ in. thick; also excluder zinc 12 in. by 13 in., and common perforated zinc 7 in. by 11 in.

First cut two sides to the dimensions given at Fig. 9, and then cut out the piece A, which is 4½ in. wide and 11 in. long; put it between the sides in the place indicated, and put four nails through each side into A; then nail the piece B (Fig. 8), which is 12 in. by 3½ in., on to the sides, the nails passing through C into the sides. The sides ought now to be parallel, and 11 in. apart.

Two pieces of wood like Fig. 10 are now to be made out of ½ in. stuff, and pieces of plain perforated zinc—11 in. by 3½ in.—are to be nailed along the sloping sides so that the wood ends and perforated zinc sides make a sort of elongated rectangular funnel, the space at the top being ⅜ in. wide and 10 in. long.

The sides of this funnel should now be found to fit exactly between the previously made sides of the trap. If anything, they should fit rather loosely, so that when they are secured together the perforated zinc will be drawn taut.

The funnel may now be put into the trap, having one edge of the perforated zinc against the side A, to which it may be fastened with a couple of tacks, and the other edge will be flush with the front of the trap. The trap and funnel may be secured together either with nails or screws passing through the ends of both.

The excluder zinc may now be taken in hand. It is 12 in. by 13 in. Turn up 4½ in. of one end, and bend it back sharply—almost flat—against the other part. This is to make the bridge (E). To make it fit between the sides of the trap, ½ in. must be cut off from each edge. This would of course be done more easily before the bending.

Form the bridge now by bending the excluder zinc to shape, taking care that its back edge will touch the bottom with a slight pressure when the latter shall have been put on.

If the sharply bent part be now hooked against the perforated zinc already in place, we can see how things look. The excluder zinc can be tacked against the front of the trap by means of the projecting portions, while the bridge fits easily between the sides. The bottom—12 in. by 9 in.—may now be put on; and care should be taken that there is a space, not varying much from ⅜ in., in front to give access to the bridge excluder. The zinc will be bent at a right angle at the top front edge, so that the bent-over portion will cover the top, which it will be found to do almost exactly. Two tacks must be driven downwards into the sides towards the front edge, but it will be necessary to have the back part secured with a couple of little buttons, so that it can be raised up to allow the trap to be cleared of drones.

This is, as I said, a positive trap, catching the drones rather than excluding them; but it owes its efficacy to the stupidity of the bees in not getting back to the hive by the same road as they came out. I ought to mention that the back part of the bridge-shaped excluder can be raised with a piece of wood thrust in from the front, so as to allow of free ingress and egress to the hive when desired. Nothing now, I think, remains to be said on this subject.

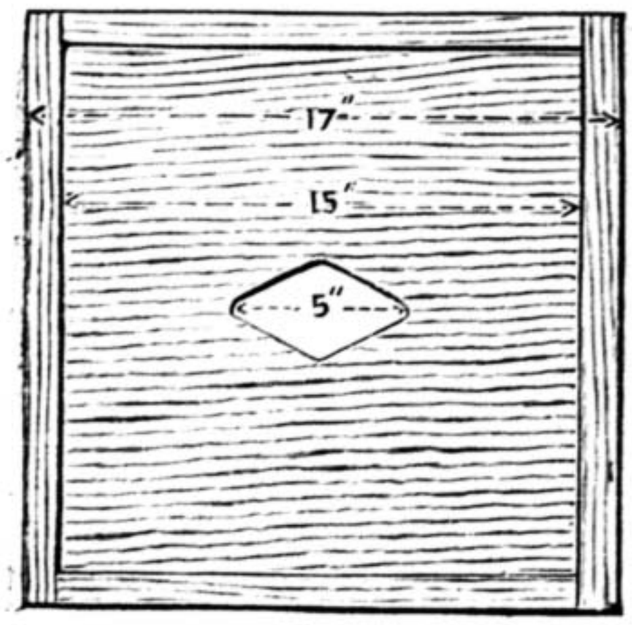
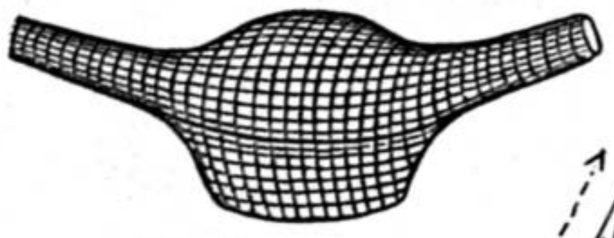


Fig. 1.



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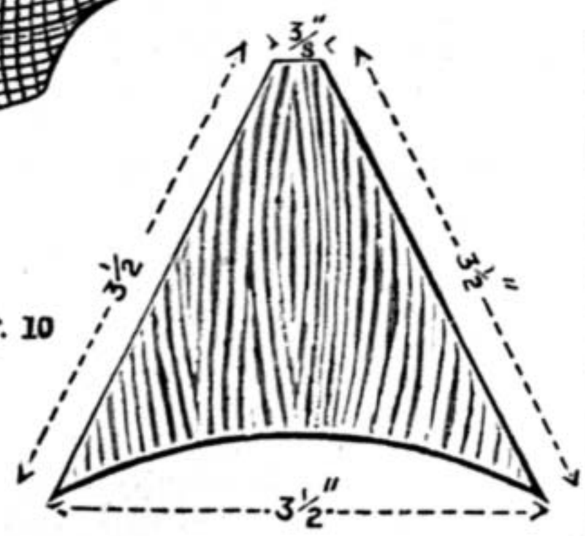

Fig. 10

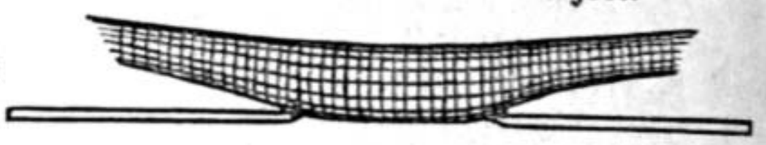

Fig. 5.

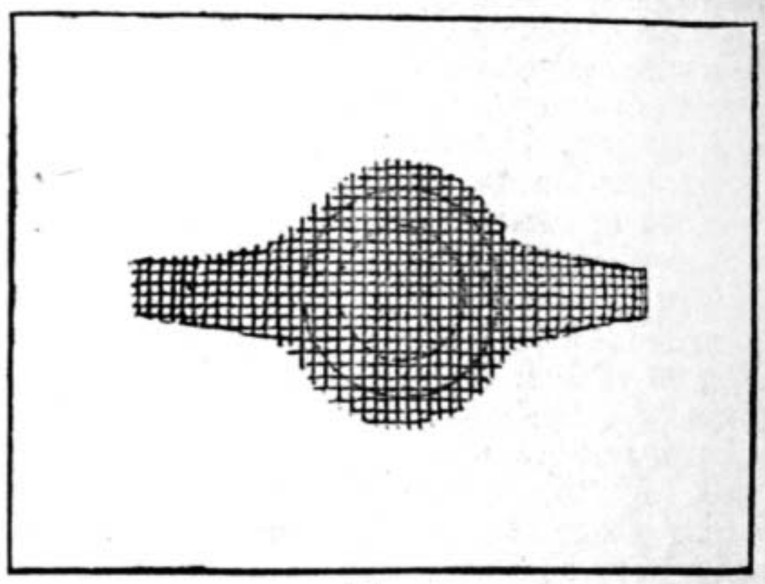

Fig. 4.

Fig. 7.

Fig. 6.

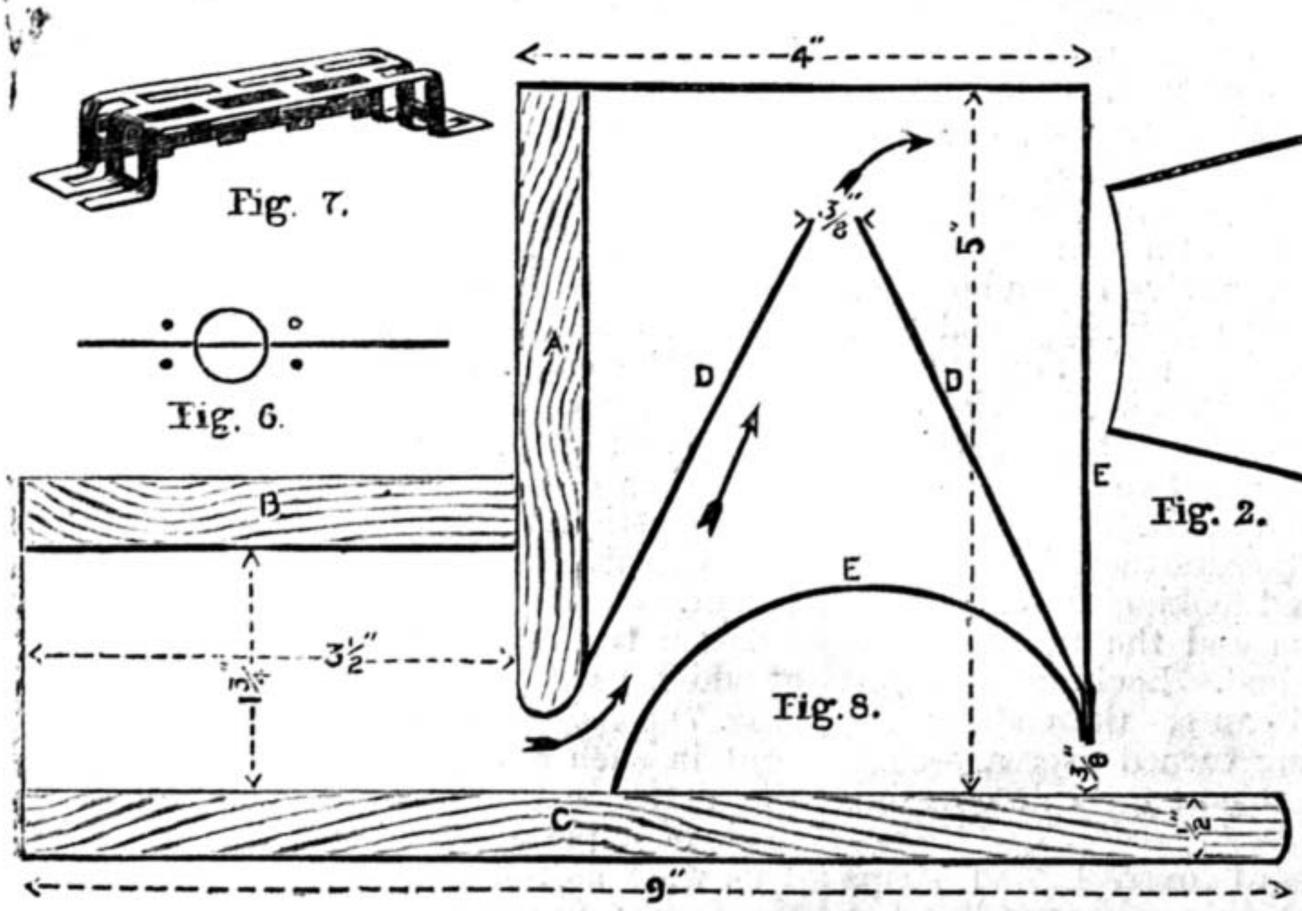

Fig. 8.

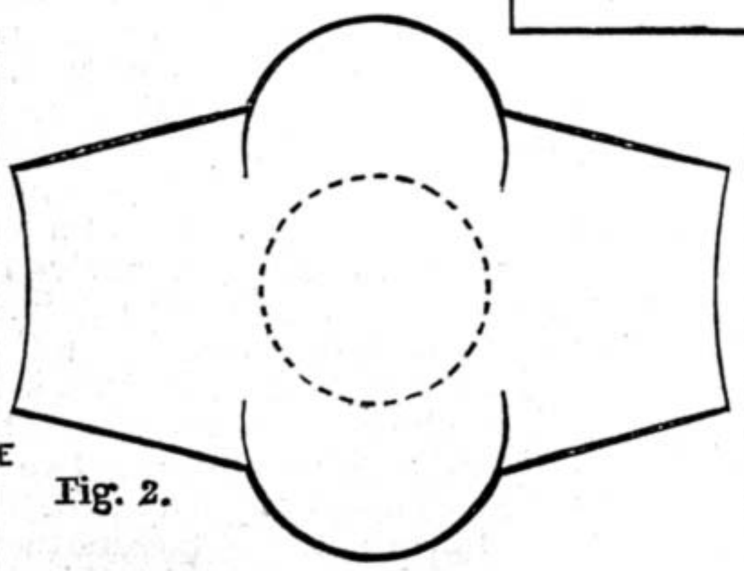

Fig. 2.

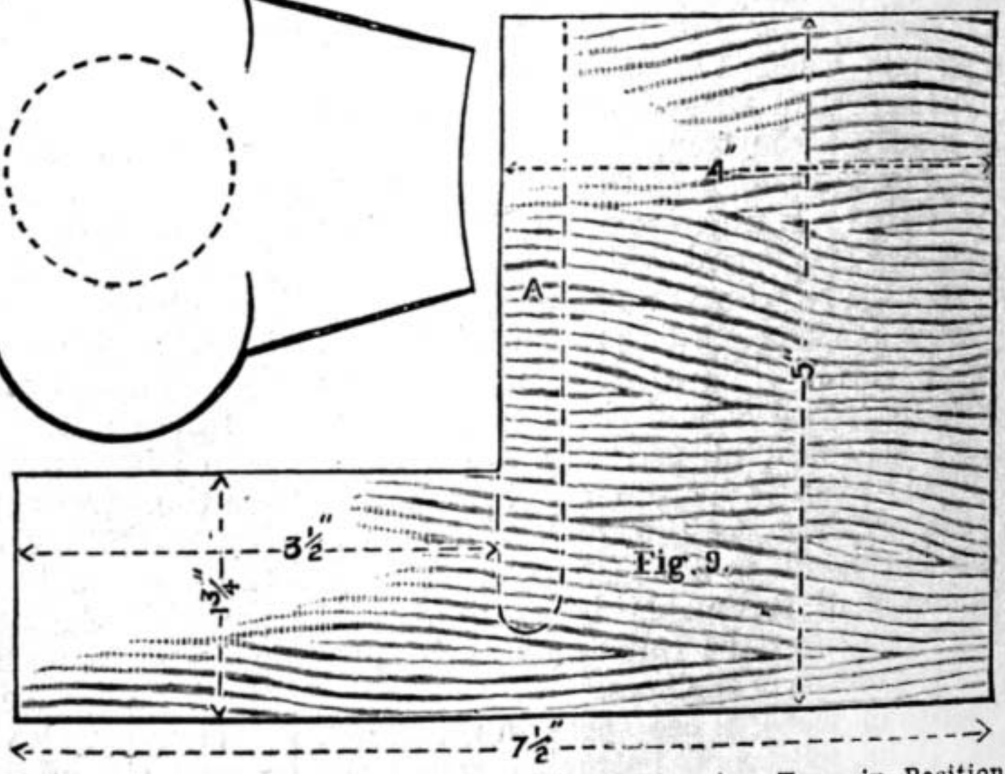

Fig. 9.

Fig. 1.—Super Clearer Board. Fig. 2.—Pattern for Trap for ditto. Fig. 3.—Trap ready for Insertion. Fig. 4.—Sketch showing Trap in Position. Fig. 5.—Side View of Fig. 4. Fig. 6.—Five-Pin Bee Trap. Fig. 7.—Simple Drone Trap. Fig. 8.—Section of Drone Trap. Fig. 9.—End ditto. Fig. 10.—End for Funnel for ditto.

MODEL ELECTRIC LIGHTS.

BY GEORGE EDWINSON BONNEY.

THE MANCHESTER AND SIMPLEX DYNAMO MACHINES.

THE Manchester dynamo shown at Fig. 58 (invented by Messrs. Mather and Platt, of Salford, near Manchester) now claims our attention. In point of simplicity in construction, and in usefulness, it bears the palm over both Siemens and Gramme machines. The carcase of a Manchester dynamo is made up of four malleable iron castings. These consist of the bed-plate and bottom pole piece in one casting, the two cores, and the top pole piece and yoke also in one casting. The whole arrangement is shown in section at Fig. 59, where A represents the top pole piece, B the lower pole piece, and C, C, the two cores. From

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this sketch it will be seen that the four horns of the pole pieces form a tunnel in which the armature works, and the two field magnet cores on each side form pillars to support the upper pole piece and yoke. These cores have wrought-iron screw-threaded pins cast in each end. These pass through holes drilled in the top yoke and the bottom bed-plate, and the cores are securely bolted to those parts by means of nuts made to fit the screwed pins. Just a few words about those cores. That they should be made of the best malleable iron and well annealed goes without saying, as this is now conceded to be a common necessity to cores and pole pieces of all dynamos. But it is not so generally recognised as it should be that the cores of these dynamos should be fitted with wrought-iron flanged ends, and that the outsides of these ends, together with a corresponding round area on the yoke and bed-plate, should be turned bright and closely fitted together. If this is done before the cores are wound with wire, the following improvements will be observed: It will be much easier to wind the cores when thus made up in the form of bobbins; the wire will be protected from injury whilst bolting the parts of the machine together, and the magnetic connection between the cores and pole pieces will be improved. When cores are not thus flanged, it frequently happens that the iron of the upper pole piece or yoke is forced into connection with some of the coils of wire whilst bolting the parts together, and this alone is the cause of some failures with this class of machine. The difference in magnetic efficiency and intensity of the field is most marked when cores are thus flanged, and the flanges brought into close, bright connection with the pole pieces. As the efficiency of the machine depends upon the magnetic changes in its field magnets, this point should not be neglected. At Figs. 60, 61, and 62, I show how the flanges may be put on. Fig. 60 shows the core as in general use. Fig. 61 shows the same core with a light cut, taken in a lathe, on each end. This must be made to fit the hole in a wrought-iron collar or washer when the collar has been made warm. Fig. 62 shows the collars shrunk on the core and turned up bright. The field magnet cores are wound with wire in the same manner as those of the Gramme machine already described—*i.e.*, wound to make the top a N. pole and the bottom a S. pole. The method of connecting the ends has also been shown.

The Armature.—The Manchester field may be easily adapted to either the ring or the H girder forms of armature, either solid or laminated. In the small machines, as shown at Fig. 23 in the fourth article on this subject (page 644). When armatures of the Gramme or Pacinotti type are used, it will be necessary to build up the commutator as described in the last article as for a Gramme machine, because we must have a commutator with several sections to receive the ends of the several coils. But, when the H girder form of armature is chosen, we must Pacinotti cogged armatures are employed. In some others the Gramme ring has been employed. When large, coarse wire is necessary on the armature, the H girder form will be found most convenient, and will be most efficient when built up of laminated plates, also select the two-part commutator used in the Siemens machine, and illustrated at Figs. 26, 27, and 28 (page 644).

Brushes and Brush Holders.—As the bed-plate of the machine is massive and broad, it carries journals for the bearings on each side of the pole pieces, and these are set wide enough apart to admit a long armature spindle. We have therefore room enough for a rocker arrangement and adjustable brush holders such as those shown at Figs. 53, 54, and 55 (page 725). The rocker works on a gun-metal sleeve fixed to the inside of one of the journals. The brushes are best made of copper wire gauze soldered to thin strips of sheet copper. Connections between them and the wires must be made as directed for the Gramme machine. Those of my readers who may wish to make up a machine of the Manchester type, will find instructions on winding the armature and all other necessary particulars in preceding articles on the Siemens and Gramme machines, the directions for one being applicable to all. The specifications on page 758 for four useful sizes of Manchester type dynamos have been kindly placed at my disposal by Mr. S. R. Bottone, electrician, Carshalton, Surrey, who will also supply the castings and all other requisites to amateurs making up these machines.

No. 1 is furnished with a solid Pacinotti cogged armature. All the others are intended for laminated armatures of the same type. The armature of No. 4 is to be wound with two strands of No. 16 wire run side by side, and wound on together. This is found more convenient for winding than a coarser wire, and the effects obtained are equally good. After winding on two strands in this way, the ends should be bared, twisted together, and soldered, before fastening them to the commutator bars. The large machine shown at Fig. 58 is furnished with a Gramme armature, wound with forty coils of wire. The small machines, coming within the scope of an amateur's abilities, have a less number of coils on their armatures. This large machine had also compound wound field magnets—that is, the cores were wound with two sizes of wire, the smaller being connected in shunt with the armature. In the small machines above described, the main coils of the field magnet cores are connected in shunt with the armature. In making arrangements for connecting the machine with the line wires of the outer circuit, it will be advisable to mount a slab of polished mahogany or other hard wood on the top of the dynamo, as shown in section at D, Fig. 59, and insert the binding posts in the wooden slab as show

Fig. 59.

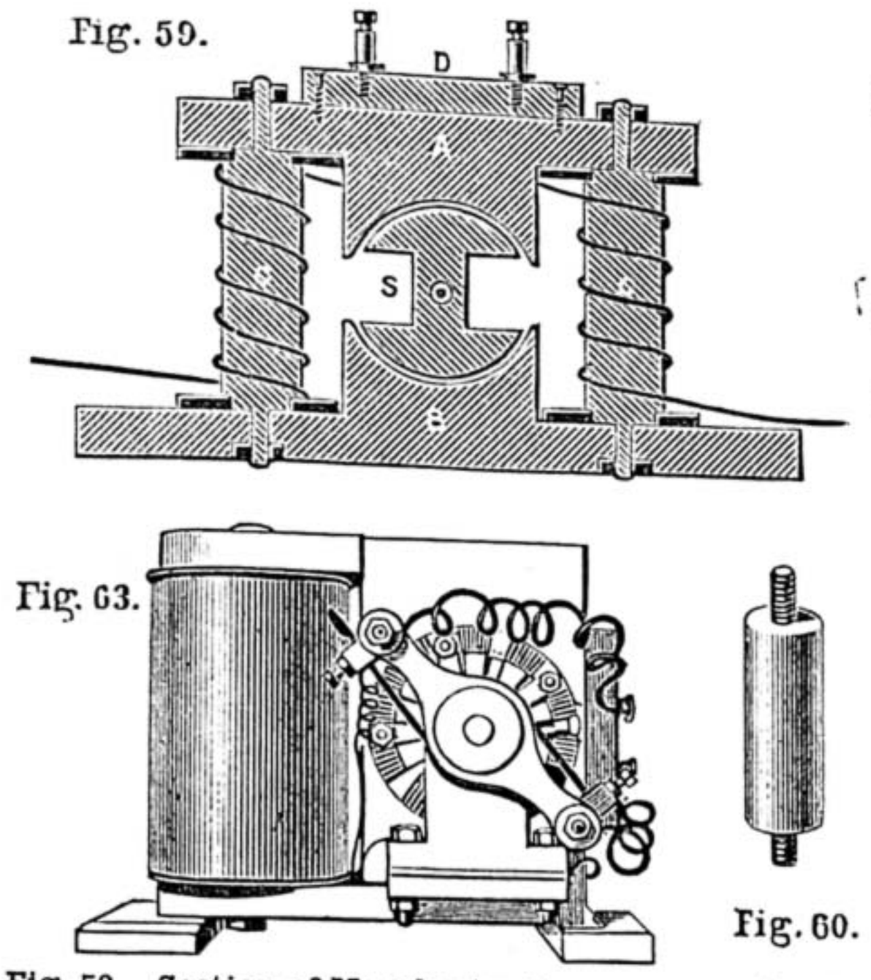

Fig. 62.

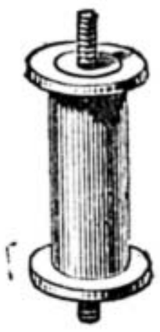

Fig. 63.

Fig. 60. Fig. 61.

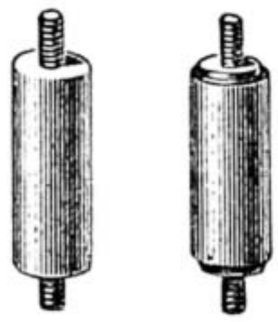

Fig. 59.—Section of Manchester Dynamo, showing how to wind the Field Magnet Cores—A, Upper Pole Piece; B, Lower Pole Piece and Bed Plate of Machine; C, C, Cores of Field Magnets; D, Wooden Platform for Binding Posts; S, Section of Siemens H Girder Armature. Fig. 60.—Usual Form of Field Magnet. Fig. 61.—Core with Ends turned down to receive Flanges. Fig. 62.—Core fitted with Iron Flanges. Fig. 63.—The Simplex Dynamo Machine.

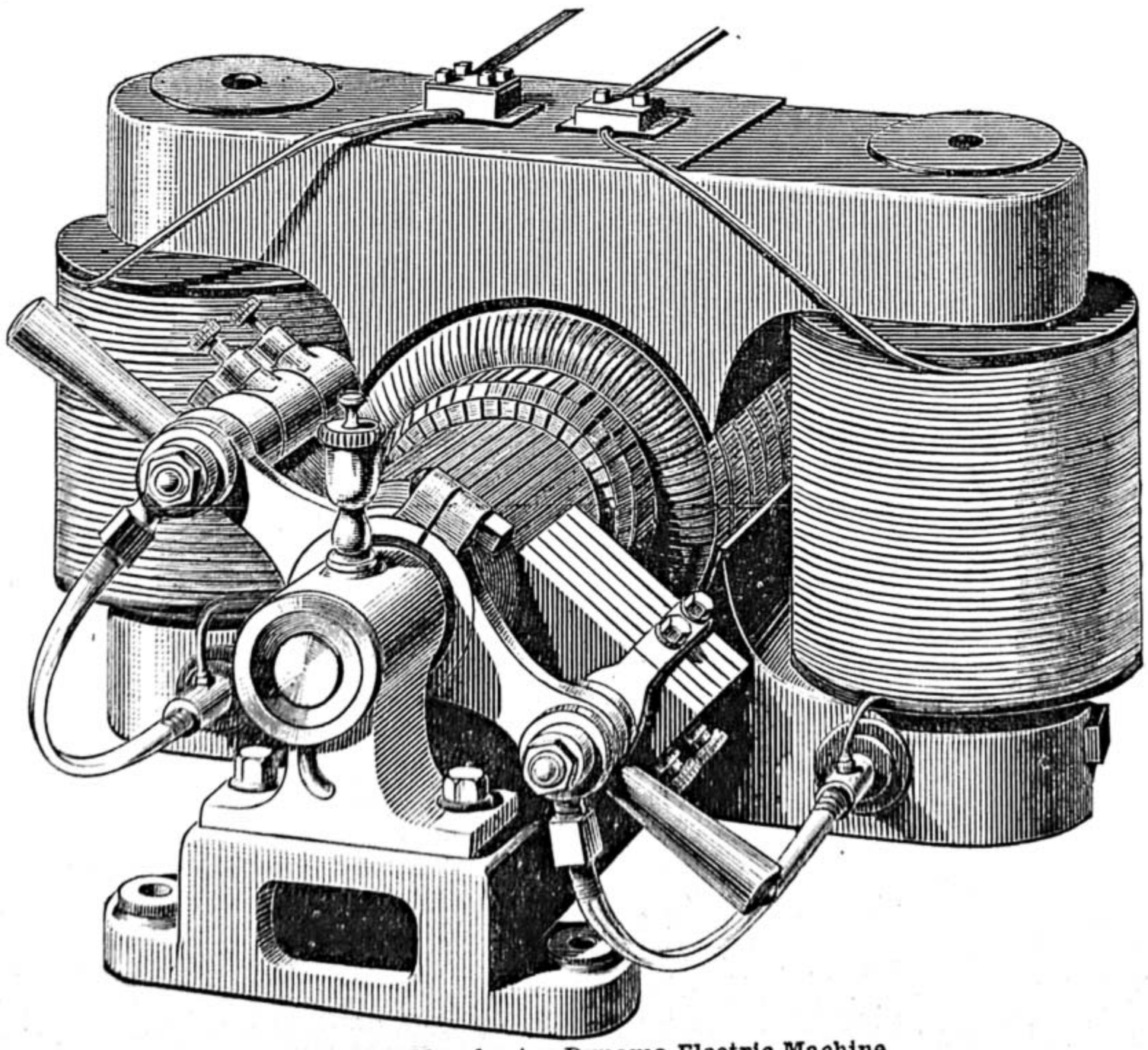

Fig. 58.—The Manchester Dynamo-Electric Machine.

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LIST OF DYNAMO-ELECTRIC MACHINES—MANCHESTER TYPE.

No.	Size of Cores.			Armature.			Wire on F.M.'s.	Wire on Armature.	Power developed.			Speed.
	in.		in.	in.		in.	All d.c.c.	All d.c.c.	Volts.	Amps.	C.P.	Revs. per min.
1	1¼	×	4	3¼	×	2	6 lbs. No. 22	1½ lbs No. 22	25	5	50	2,500
2	2¼	×	6¼	4¼	×	2½	10 lbs. No. 22	4 lbs. No. 20	50	5	100	2,000
3	3	×	7¼	6	×	6	20 lbs. No. 20	4 lbs. No. 16	55	10	200	1,500
4	4	×	10	7	×	7	90 lbs. No. 16	12 lbs. No. 16	50	30	600	1,200

LIST OF DYNAMO-ELECTRIC MACHINES—SIMPLEX TYPE.

No.	Size of Cores.			Armature.			Wire on F.M.'s.	Wire on Armature.	Power developed.			Speed.
	in.		in.	in.		in.	All d.c.c.	All d.c.c.	Volts.	Amps.	C.P.	Revs. per min.
1	2¼	×	5	3¼	×	2	6 lbs. No. 22	1½ lbs. No. 22	25	5	50	2,500
2	3¼	×	7	4¼	×	2½	10 lbs. No. 22	4 lbs. No. 20	50	5	100	2,000
3	4¼	×	8	6	×	6	20 lbs. No. 20	4 lbs. No. 16	55	10	200	1,500
4	6	×	10	7	×	7	90 lbs. No. 16	12 lbs. No. 16	55	30	600	1,200

The Simplex Dynamo.—The machine shown at Fig. 63 is thus named because of the simplicity of its parts. If we take a Manchester dynamo and cut right down through the machine, so as to lop off one core and the ends of the pole pieces which it supports, the remainder of the machine will represent a Simplex dynamo having only one core. All the other parts of the machine are constructed exactly the same as the Manchester dynamo. The armature may be a Gramme ring, a Pacinotti cogged ring, or a Siemens H girder, but I should advise the Pacinotti as being the most convenient, and this is the form arranged for in the following specifications :—

No. 1 has a solid Pacinotti cogged armature. All the others are arranged for laminated armatures. In winding the armature of No. 4 machine, two strands of No. 16 wire are to be used, as in the No. 4 Manchester machine. The armature is connected in shunt with the field magnet coil. Stability is ensured by bridging the two pole pieces with a plate of brass or of gun-metal. The binding posts may be mounted on this bridge, or on top of the machine, as shown in the Manchester dynamo already described. A high efficiency is claimed for this machine in working. It is also easily put together, and all its working parts can be readily adjusted. All the remarks made respecting the Manchester dynamo are equally applicable to this, so it will not be necessary to repeat them.

Designing Dynamos.—I should strongly advise the amateur not to attempt designing dynamos with a view to making his own patterns and castings, and thus reduce the cost. Unless he is well versed in the laws which govern the proper construction of these machines, he will find himself landed in a hopeless muddle, with castings too large, too small, or so ill-proportioned as to be almost useless. Then, too, the efficiency of the machine so largely depends upon the quality and condition of the iron used in the castings, as to need an amount of skill not always obtainable in country foundries, where the men do not know the requirements for a dynamo machine. Before winding the cores of the field magnets or the armature of a machine designed by an amateur, he will have to take into consideration the work desired to be done by the machine, and the resistance offered by all this work, and then calculate the size and length of wire necessary. It is almost useless to think of a dynamo as of a galvanic battery giving an E.M.F. of so many volts at the poles, since the E.M.F. developed in a machine is so largely dependent upon the character of work being done by it, the E.M.F. of the current being increased or decreased by the strength of the magnetic field, and this must vary with the varying strength of the current passing through the field magnet coils. In planning the winding of a shunt dynamo, the resistance of the outer circuit—*i.e.*, work to be done—must first be ascertained, then the resistance of the armature coils must be calculated not to exceed one-twentieth the resistance of the outer circuit, and the resistance of the coils on the field magnets must be twenty times the resistance of the outer circuit. I cannot go fully into this part of the subject here. Perhaps a more able pen than mine may go more deeply into the subject of dynamo designing, and publish the results in a future number of WORK. Those of my readers who may wish to study up the subject for themselves, will find some plain directions in the books already named, and in "Electrical Instrument Making for Amateurs," pp. 108-116. The subject is also treated in a more advanced style in Walker's "Practical Dynamo Building for Amateurs," pp. 18-28; in Esson's "Dynamo-Electric Machines," pp. 140-181; and in Thomson's "Dynamo-Electric Machinery," throughout the appendix.

Working Dynamo-Electric Machines.—Before concluding this part of my subject, I will give a few hints on working the machines, and hope they may prove acceptable to my readers. A machine may be worked from any source of power, be this horse traction, foot motion (as in a lathe), by winch handle, windmill, water motor, hot-air motor, gas engine, or steam engine. Uniform speed is greatly to be desired in the motor, and this is best obtained from a steam engine fitted with a sensitive governor. Small gas engines do not run steady. There is a tendency to race, and the impulses given to the piston are observable in flickering of the lamps. This fault is less observable when the engine is working with a heavy load, and is taking in gas at every stroke of the piston. Water motors give good results when the head or pressure is constant, and the load is also constant. This is probably the cheapest source of power. Windmills are very inconstant motors, and altogether unsuitable for driving dynamos engaged in direct electric lighting. They may be used (under certain conditions) to drive dynamos for charging secondary batteries employed in electric lighting. Animal motors as a source of power are costly, and the work is very hard. Treading a foot-lathe to light up a 10 candle-power lamp is pleasurable excitement for a few minutes whilst the novelty lasts, but the necessity for a uniform high speed makes the work very tiring to the leg muscles. I need scarcely mention the work of driving a machine by turning a winch handle attached to multiplying gear, as it so nearly resembles grindstone drudgery. One thing must be impressed on the reader's mind :—To ensure a steady, bright, uniform light in the lamp or lamps, the *speed of the dynamo must be uniform*, since any variation in speed will vary the E.M.F. of the current and consequent brightness of the lights. If the speed given in the last column of the specifications above mentioned is greatly exceeded, the lamps will brighten up, and have a merry life, but a short one. On the other hand, if the machine is not driven up to speed, the lamps will not be fully lighted. When the filament is glowing white, with just a suspicion of sparkle in it, the E.M.F. of the current is quite high enough. A dull red or creamy yellow about the filament shows that the speed of the machine may be increased with advantage.

The dynamos described in the foregoing pages are all shunt-wound, and are constructed to furnish current for a certain number of incandescent lamps arranged in parallel. If a larger number of lamps are put on than the machine can furnish with sufficient current, the brightness of the lights will fall, because the resistance of the circuit will then be much less than that of the coils on the field magnets, and the magnetic intensity of the fields will fall as a consequence. If the machine fails to give out its proper quota of current when driven at the right speed, we may suspect a wrong adjustment of the brushes, and should then alter the lead of these until the best effect has been obtained. This we can easily do if the brushes are fixed on a rocker and controlled by a swivel and spring arrangement such as that described for the Gramme machine. Speaking from a theoretical point of view, we should adjust the brushes to cut off the armature current just as its coils have passed the most intense part of the magnetic field into the neutral gap between the pole pieces; but it is found in practice that the armature retains some residual magnetism after its coils have passed the point above-mentioned, and the influence of the field is carried beyond that point by the speed of the armature. We shall, therefore, very likely find the best position for the brushes to be forward beyond the neutral point, and this position may be affected by the speed at which we are driving the machine. The brushes should not press too heavily on the commutator, since too much pressure on the bars causes excessive wear. They should rest on a bar and a half of the commutator, and cover the whole width, so as to prevent excessive sparking, since the electric sparks burn away the brushes and the commutator. A little oil applied to the bars after cleaning, and then wiped off again, will be found quite enough lubrication; but the bars and brushes should always be well cleaned after a run of a few hours, and before starting again. Some machine minders prefer using blacklead as a lubricant, but this must be put on sparingly, since it is apt to choke up the spaces between the commutator bars and short-circuit them.

After the cores of the field magnets have been once magnetised, they should retain some residual magnetism, and this is generally found sufficient to start the machine. But it sometimes happens that the cores of small dynamos lose their residual magnetism, or they do not so readily become magnetised as larger ones. In this case the remedy is, of course, to send a current from a battery through the coils, as in the first instance, and thus re-magnetise them. When doing this be sure to send the current in the right direction, or the poles will be reversed, and then all the connections will have to be altered. For a similar reason, never play with the dynamo as a motor.

Dynamos for Lighting Arc Lamps.—The

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carcase of a Manchester dynamo may be easily wound with wire to make it suitable for lighting arc lamps. For instance, to render a Manchester, having cores 3 in. in diameter by 7¼ in. in length, and an armature 6 in. in diameter by 6 in. in depth, suitable for lighting an arc lamp of 1,000 candle-power, we have only to strip off the wire put on for incandescent lighting and wind the machine afresh. The cores of the field magnets must then be wound with 8 lb. of No. 14 double cotton-covered copper wire on each core, and the armature wound with 4 lb. of the same kind and gauge of wire. The two inner ends of both field magnet coils must then be connected to one of the brushes, and the two outer ends to one of the binding posts. The coils will then be connected in parallel. A wire goes from the binding post to the lamp, and from this back to the other binding post, which is in turn connected to the other brush. Thus the whole (coils, lamp, and armature) are connected in series, and this is found best for arc lamps. The machine will supply a current of 12 ampères at a pressure of 50 volts, when driven at a rate of 900 revolutions per minute, or will give twice this amount of current if driven at a rate of 1,800 revolutions per minute. A larger machine, having cores 4 in. by 10 in., and an armature 7 in. by 7 in., should have 10 lb. of No. 10 wire on each limb, and 12 lb. of No. 12 on the armature. This will give a current of 15 ampères at a pressure of 55 volts when driven at the rate of 900 revolutions per minute, or double this output at 1,800 revolutions per minute.

An arc lamp suitable to this machine will be described and illustrated further on, after we have considered the desirability of storing surplus electric energy in accumulators, and lighting incandescent lamps from these secondary batteries.

PARAFFIN LAMPS.

BY THOMASO.

ARM OF RESERVOIR—SUSPENDING WIRES—CHAIN.

ACCORDING to promise, I am now going to describe the method of drawing a design for one of the arms that hold the reservoir and support the shade, half full size.

Draw a perpendicular line. On it describe a circle the size of the reservoir—in this case 5½ in. Draw a line across this circle to represent the join in it. About $\frac{3}{16}$ in. below it—that is, allowing for the protuberant part of the join—draw two lines across ½ in. apart to represent the ring supporting the reservoir. The length of these lines is, of course, the extreme diameter of the ring. From the join in the reservoir measure the distance to the top of the burner, and mark it on the paper. This gives the height (a convenient one) of the lowest edge of the brass rim supporting the shade. Draw lines across to represent this rim ½ in. apart. Their length is about ½ in. more than the extreme diameter of the edge of the shade, it being necessary to make the brass rim rather larger than the shade.

Now comes the critical part. The arm has to be drawn in the position it is to occupy. A man handy with the pencil would put it in, trusting to eye alone. To simplify matters for those who are not good at freehand drawing, I have squared the engraving, and made it just half size. All that it is necessary to do is to draw the same number of squares twice the size, in ink, on a piece of paper, and then draw the figure—the squares serving as a guide. When finished, cut away the superfluous paper, and put the drawing in position on the other drawing.

As drawn, Fig 23 would support a 12 in. shade holder at a distance above the ring of about 6¼ in. If you intend using a larger or smaller shade, the middle of the figure, where indicated by the arrow, can be lengthened or shortened as required by cutting the drawing, and separating or lapping the two parts as may be required, touching it up afterwards with the pencil in order to get an unbroken curve. A view of A and B from the top is given, and the position of the rivet-holes indicated. It is best to have them cast of the shape shown, and afterwards file them up to fit the curve, as shown by the dotted line. C is intended for a foot to support the lamp when stood on a flat surface (an arrangement few hanging lamps possess), and D is to take the supporting chain.

Having got the drawing right, prepare the wood for the pattern by gluing two pieces of ¼ in. fretwood together, with the grains running in opposite directions. Leave them to dry under pressure, and then plane down to $\frac{5}{16}$ in. each side equally. Make a tracing of the drawing, paste it on the wood, and cut out the pattern. Let all the curves be free of sudden bends, and remember that any inequalities in the pattern will have to be smoothed down in three castings. Observe that the pattern tapers at the ends, and is round in section. The lugs are glued on after the other part is finished. Sand-paper smooth, and varnish, smoothing each coat of varnish down with sand-paper.

I have been thus particular in describing this pattern, because the method is applicable to fragile patterns in general.

File up the castings, using a half-round file and emery-cloth, and then burnish them. Drill the holes for the chains, and then temporarily solder them to the ring supporting the reservoir. This soldering is only done to enable you presently to drill the holes for the rivets in their proper places. Make the shade holder of ½ in. by ⅛ in. flat wire; join in the same manner as in Fig. 22 (page 696), and solder it lightly in place. Observe that the arms are upright, and that when the shade is put into place the chimney projects through the middle of the opening. If it does not do so, it is a sure sign that the inner faces of the lugs have not been filed at the proper angle. This part wants a little fitting to get it right, and the soldering facilitates matters.

When all is correct, drill the holes (only just large enough for the rivets, by the way), and then rivet. Do not smash the ends of the rivets. One blow with a light hammer will be enough if the rivet fits the hole, and if finished off with a hollow punch or rivet set, they have an ornamental appearance.

Now as to the length of the suspending wires, both for Fig. 16 and Fig. 17 (page 696). The right length is found when, on being pushed up as far as it will go, the lamp permits people to walk under it without raising bumps on their craniums.

Although this is very desirable for the reason given, it is objectionable in another way. Take the average height of ordinary rooms as being between nine and ten feet—we will say nine feet, for the sake of illustration. If you have the lamp high enough to allow six feet to walk under it, the bottom of the lamp will only be about three feet from the ceiling, and therefore, only a very short length of chain can be used—too short, in fact, to be of any use. Besides, the distance of the burner from the table would be about four feet—too far away to allow anyone to read or work in comfort.

Fig. 16 cannot be put high enough to clear passing heads, in consequence of the space taken up by the remains of the chandelier.

If the lamp is intended for a hall, or any room where reading or other "eye-work" is not intended to be indulged in, the idea of weights and chains had better be abandoned, and the lamp simply suspended by the three wires or chains.

I think the majority of people have a table in the middle of the room, from which position it is rarely moved, except for cleaning operations. If the lamp is suspended over this table (a position hard to improve on), the table would prevent people knocking their heads.

That contingency having been thus provided against, there is no reason why longer suspending wires should not be used. I think, that for a room nine feet in height, a length of 3½ feet should be allowed to them. This allows a drop of about 18 in.—quite sufficient, considering the length of the wires, and the ease with which (in the case of Fig. 17) a short length of strong chain can be interposed between the hook from which the lamp is suspended and the casting to which the wires are fastened at the top. In the case of Fig. 16, if you should at any time want it to come down lower than you originally made it, you can easily accomplish it by adding a piece of chain to each side; and inasmuch as with the lengthened chain there would be great danger of the weights smashing the shade if the lamp happened to be pushed up quickly, it is necessary to put a ring (or something that will answer the same purpose) through both chains, at a distance from the ends which are hooked to the casting equal to half the length of the chain added. These rings prevent more than the proper amount of chain passing over the wheels, thereby keeping the weights from the shade. In Figs. 16 and 17 the wires are shown much shorter than they would be in the actual lamp.

It is simply a question of obtaining the greatest length of chain possible without allowing the weight to come down low enough to either put the lamp out or smash the shade and chimney. Of course, it is easy to get a good length of chain; but we are in this position: the greater the quantity of spare chain we allow, the less need we have of it.

The 3½ feet I have mentioned above is a very convenient length for the wires. If it is desired to retain this position of the lamp, and the room is more or less than nine feet in height, all that it is necessary to do is—add to the length of the wires (or subtract, as the case may be) the difference between nine feet and the height of your room.

Although I have said "wires," there is no objection to using chain; but the wire is cheapest, and is capable of being cleaned. If you use chain for Fig. 17, you must fix something on it (a ring, for instance) to act as a stop, preventing more than a certain amount of the chain passing over the wheels; otherwise the weight will drop on the shade when the lamp is pushed up.

The size of the wire should not be less than No. 9, which is about ⅛ in. Make the loops as shown in Fig. 13 (page 696). Do not make more than three links, if you have links at all, as the multiplying of the links renders it more difficult to get all three wires of the same length, which is essential.

The wire might be all in one piece, provided it was made nice and straight; but the three links has an advantage over both

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single wires and chain in this way :—Most people have festive gatherings at some time or other; for it is a poor heart that never rejoices. On such occasions it is often desired to clear the centre of the room, either to hunt the nimble slipper, or for some other purpose necessitating brisk locomotion on the part of the assembled guests. Now, if the lamp is kept at its old level, it will not be long before it is flying in all directions, making the social party anything but a festive one to those who come into collision with it.

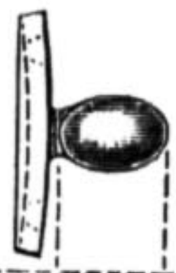
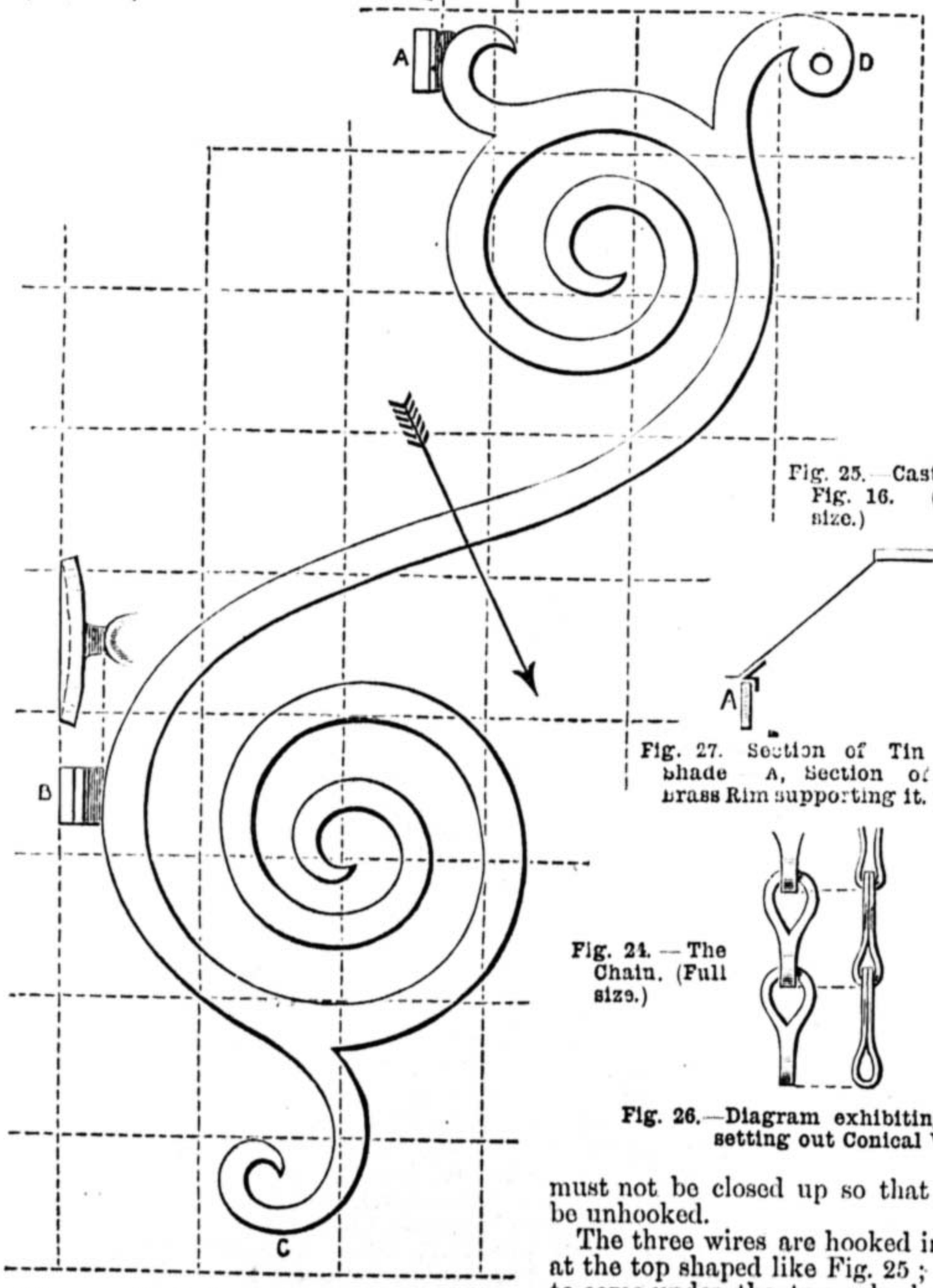


Fig. 23.—Arm for suspending Hanging Lamps, shown in Figs. 16, 17, page 696. (Half size.)



The remedy is simple. Take off one link from each wire, and hook on the weight higher up the chains. I may here remark that it is never necessary, either in taking down these lamps or a gas chandelier, to take down the weights as well. Simply catch the disengaged end of the chain into that on the other side of the wheel.

I have made frequent mention of "chain." That shown in Fig. 24 is the most suitable, as, from its construction, it cannot pull apart under any strain short of that required to break the metal. It has its drawback, however, in the difficulty, or rather impossibility, of joining two pieces or lengthening the chain, except by adding one link at the time.

To proceed with the making of the wires as illustrated. Having straightened the wire with a mallet, cut the pieces to form the links of such a length that when three are placed end to end they measure the required length. Thus: if the finished length is to be 42 in., cut each link 14 in. Now make the loops on the ends, and you will find on temporarily linking three of them together that they are collectively about 6 in. too short. To make up this loss, render subsequent unhooking easier, and at the same time improve the appearance, make short links S-shaped, and put them where shown in Figs. 16 and 17. The ends of the S-shaped links which hook into the arms

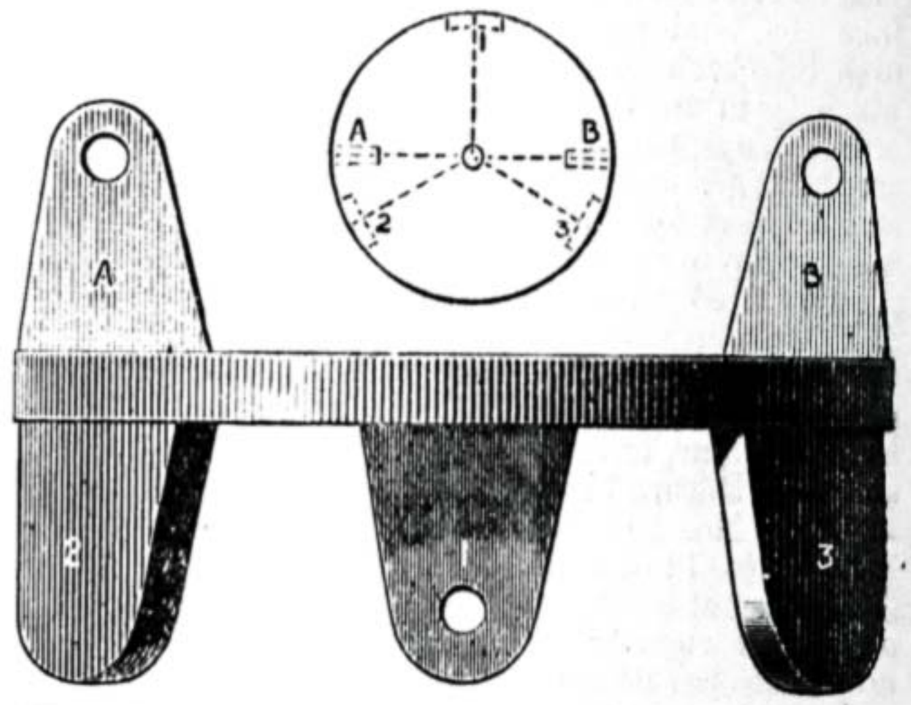


Fig. 25.—Casting at Top of Fig. 16. (Approximate size.)

Fig. 27. Section of Tin Shade A, Section of Brass Rim supporting it.

Fig. 24.—The Chain. (Full size.)

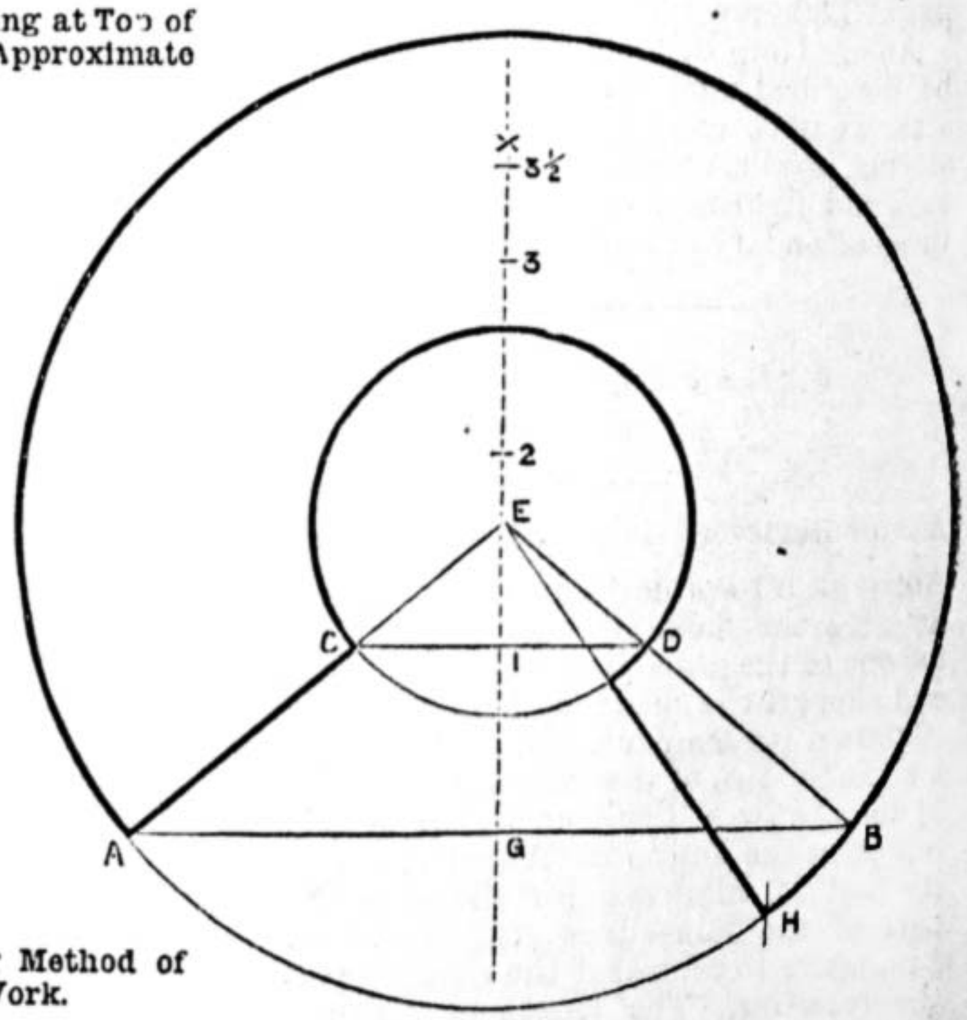


Fig. 26.—Diagram exhibiting Method of setting out Conical Work.

must not be closed up so that they cannot be unhooked.

The three wires are hooked into a casting at the top shaped like Fig. 25; A and B are to come under the two wheels fixed at the top of the gas chandelier, as shown in Fig. 16. The size of the rest of the casting does not matter particularly. It is conveniently made of ¼ in. walnut fretwood. The small sketch above Fig. 25 is a plan of that figure, and shows the position of the different lugs. This is important in this lamp, in order to prevent the two weights (or one, at any rate) catching in the suspending wires. A hole is drilled through the middle of the casting, as shown in the small figure, to suspend a smoke consumer from.

You may, perhaps, be able to hammer up a 3 in. circle of brass, saucer-shaped, to serve this purpose. If not, the pattern shown can be obtained of Messrs. Stanton aforesaid. A mica one fastened to the top of the chimney would do better, and be cheaper, but does not look so well.

As to the weights, they can either be bought second-hand, if those belonging to your chandelier are too light, or you can make them as described further on.

All the brass-work should be polished and burnished. If you like, you can polish and lacquer the shade holder and Fig. 23 in the way mentioned for the reading lamp; but it is as well not to have too much lacquered work about suspended lamps, because, from their position, they form an excellent resting-place for the flies, and as a result get very dirty. If this occurs to lacquered work, you may be able to wash the dirt off for a time or two without fetching off the lacquer, but it will not last long with such treatment. It is best to polish and burnish, and when it gets dirty or tarnished, use one of the soaps sold especially for cleaning metal, such as Brooke's.

Some fringe hung round the shade, as shown in Fig. 17, adds to the appearance. Red looks very well. Glue or sew it on to a narrow strip of card to which small wire hooks have been previously fastened, and hook it on inside the shade holder. Now, if you have made the latter the ½ in. larger all round that I recommended, the shade will fit in nicely without shake.

If preferred, the common green and white card gas shades or a tin one of the same shape can be used. The latter is a useful shade, as it can be painted white inside and

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green outside with one of the numerous enamel paints. It looks well by daylight, and throws down the light well when the lamp is alight.

If you intend having a tin shade, make up your mind first as to whether or not you are going to wire the edge; then proceed as follows:—On a sheet of stiff paper draw a horizontal line equal to the external diameter of the shade holder, or gallery. If the edge of the shade is going to be wired, add 1½ in. to the length of the line; otherwise, add only ¾ in., to allow for turning out as in Fig. 27. This line is shown at A B, Fig. 26. Determine the height of the shade (a quarter the length of A B is a good measurement), and draw the line C D at that height, not less than 4½ in. long. Join A C and B D, prolonging the lines until they meet at E. From E as centre, with the radius A E describe a circle, and from the same centre describe another circle with the radius C E. A wedge-shaped piece is now to be cut out, and the edge wired (if so intended). To get the size of this wedge-shaped portion, cut from the outer circle to the centre (H to E) and round the two circles, and then lap the two ends until you get the right size. Then cut out in tin, and bring the two straight edges together, lap, and solder. Observe that it does not "wobble" when stood on a flat surface, and do not have any unsightly lumps of solder about the join. Turn the outer edge outwards, and the inner edge upwards, as shown in Fig. 27. Solder three pieces of wire inside, bent as in the same figure, to keep the shade in place, and then paint.

The above method of getting the shape of the tin for the shade is the easiest of many. If you cannot get the large sheets of tin, or sheets large enough, you must make the shade of two pieces.

It must not be forgotten, if the shade is changed at any time, that the weights will also want adjusting.

HOW TO UTILISE WASTE DRY PLATE BOXES.

A PAPER FOR PHOTOGRAPHERS.

BY DEVOIR.

When I look around my dark room and view the many empty plate boxes, a sad feeling is apt to come over me when I think of the good plates—many of which, alas! are spoiled—once ensconced safely within; and also to think that such good and true boxes should have meted out to them such ill-deserved fate as being burnt, or to be consigned to that place where many of their contents have gone before—namely, the dust-hole. Also I can see so many small things laying about, that I have felt it imperative to consider some scheme to utilise the first-named, and provide a resting-place for the latter. The result of my deliberations I will now relate.

The forms of boxes are various: some, indeed, are useless for our present purpose, but the majority of the boxes used in the better-known systems of packing are well adapted for use. Take as example the three principal kinds: firstly, those made on the system used by Messrs. Thomas & Co. for their Pall Mall plates; secondly, those similar to the Ilford style; and, lastly, those by Messrs. Edwards, who pack in boxes with wood grooves.

Let us deal with the first-named. These will be found to consist of three parts: the inner rough case actually containing the plates, the case into which this is slipped, and, finally, the outer covering, into which the second in its turn is placed. We shall at once discard the inner box, it being quite useless. The outer cases we must fix together in tiers, as shown by Fig. 1. I have taken, as an example, a nest of one dozen drawers or boxes, but, of course, there is no limit either way. The space between each tier is occupied by a thin slip of pine or mahogany, as shown, half full size, by Fig. 2. These slips are placed at both front and back of boxes, and are fixed thereto by glue, and a few brads or nails as indicated. Let the nails, or whatever is used, have big flat heads. If it is anticipated that the nest will be shifted about much, it will be well to put two slips on top of boxes, and put sides to the whole—that is to say, a piece of stuff the same width as the length of the boxes, and in height the total thickness of boxes, plus so many slips. Having got so far, place

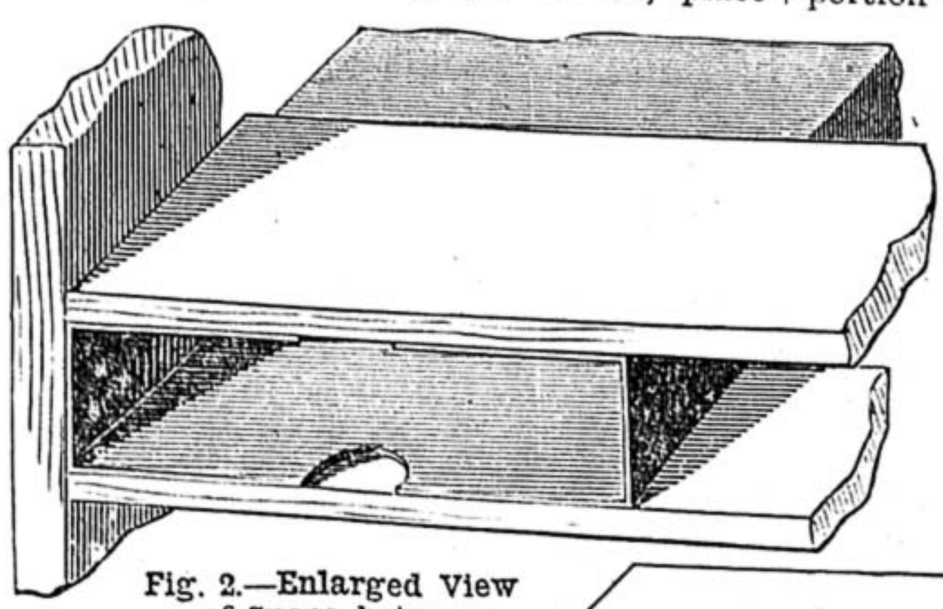

Fig. 2.—Enlarged View of Space between each Tier.

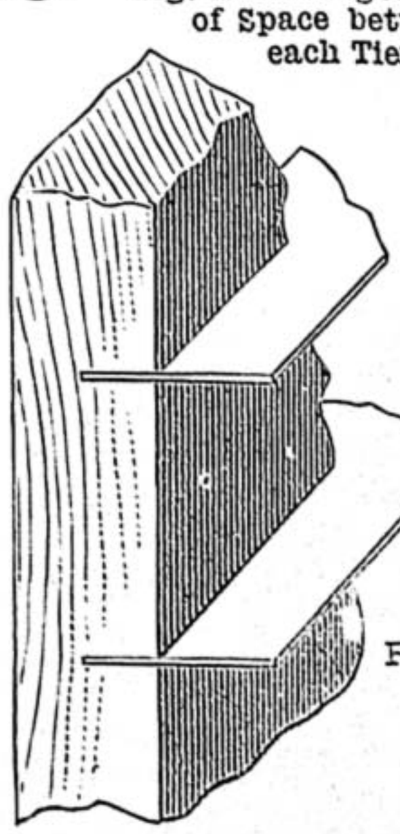

Fig. 5.—Enlarged View of Side of Nest.

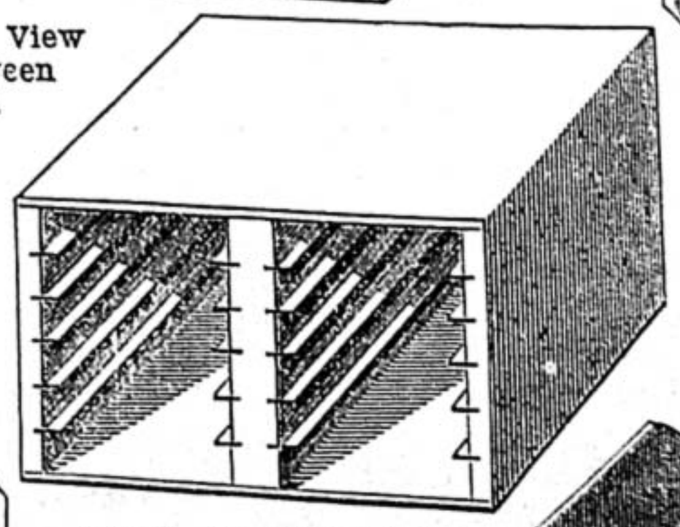

Fig. 4.—Nest of a Dozen Boxes.

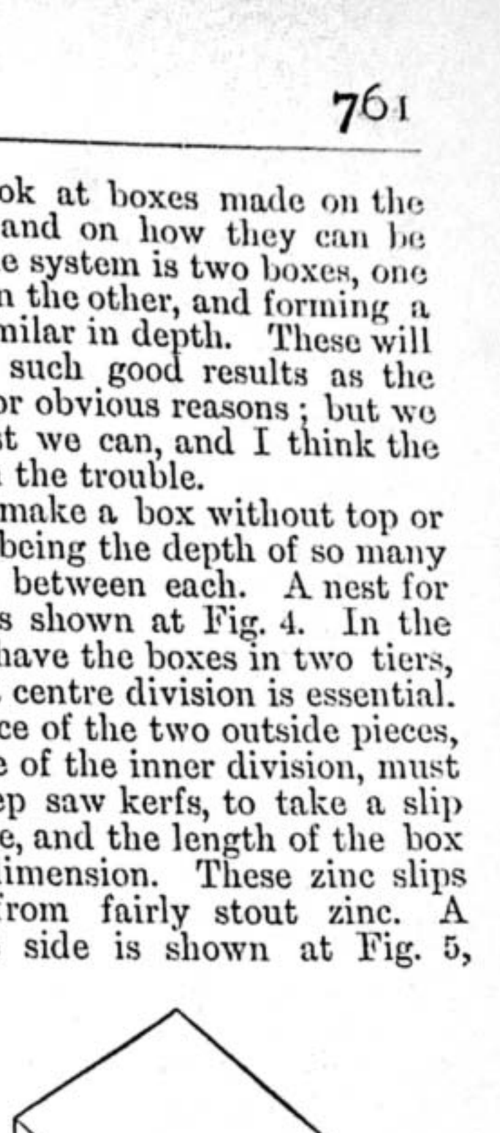

Fig. 1.—Outer Cases fixed together in Tiers.

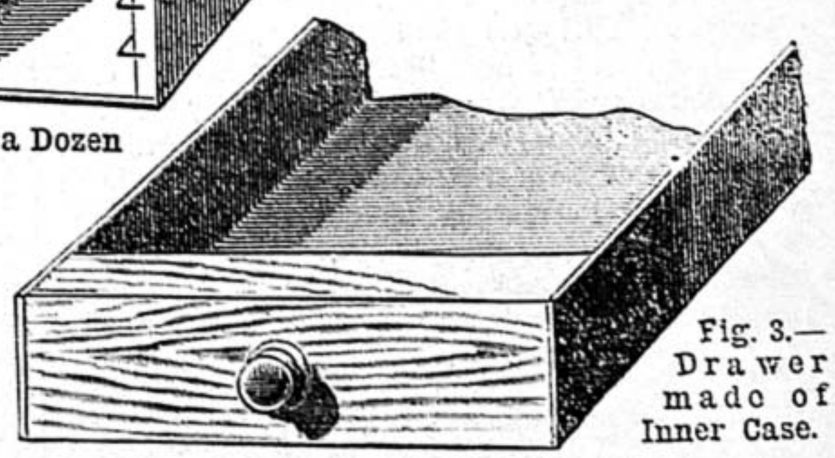

Fig. 3.—Drawer made of Inner Case.

aside to dry, and then proceed to deal with the inner cases in the following manner—

Fit to the open end of each a piece of mahogany or pine, ⅝ in. thick, and glue in, but do not glue one of the long edges for reasons hereafter to be seen; a pin or two, placed judiciously, will add strength; a half size view of what is intended is given at Fig. 3. When dry, a sharp penknife must be passed round the three top edges, the fourth edge being the wooden one not glued, this allowing the top to be removed, and thus form a kind of drawer with wooden front, in which can be fixed either a small mahogany or bone knob, obtainable at an ironmonger's, or a round-headed screw would answer the purpose.

When all are completed, if stained and varnished, we shall have quite a fancy nest of useful drawers for a very small expenditure.

I have been dealing with boxes made for half plates as being a most convenient size for illustration, but the principle is readily adapted to suit any size.

Now let us look at boxes made on the Ilford principle, and on how they can be made useful. The system is two boxes, one a trifle larger than the other, and forming a lid, both being similar in depth. These will not give nearly such good results as the former variety, for obvious reasons; but we must do the best we can, and I think the result well worth the trouble.

We must first make a box without top or bottom, the size being the depth of so many boxes, plus ⅛ in. between each. A nest for a dozen boxes is shown at Fig. 4. In the case shown we have the boxes in two tiers, and, therefore, a centre division is essential. In the inner face of the two outside pieces, and in each face of the inner division, must be cut ⅛ in. deep saw kerfs, to take a slip of zinc ⅛ in. wide, and the length of the box for the other dimension. These zinc slips must be cut from fairly stout zinc. A portion of one side is shown at Fig. 5, which sketch will render my meaning clear, I think.

The boxes have now to be dealt with. We can, if so cared for, dispense with the lid entirely, and use only the bottom; but the great objection to this is that dust can enter, whereas, if the following method is adopted, it will be found to be practically dust-tight.

Proceed in this way: place the lid on as usual, and glue round the intended back end a piece of black twill or calico about 3 in. wide—about an inch to be glued to top, the same to end, and remainder to bottom. When dry, cut with a keen knife the angles at back of top box only; this will allow the top to be thrown back. For additional strength, a piece of ¼ in. pine should be glued inside the bottom box at each end. The front piece will take the knob, should one be used. Fix the knob near the bottom edge, as a piece will require to be removed from lid to allow passage of knob. Now slip the box into position, label the front, setting forth contents, and our job is completed

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I scarcely need have referred to the third class under consideration, as the utilisation of these is a very simple matter—in fact, the idea of supplying the plates packed in such form is to provide a place for storage when the negative stage is reached. They simply want mounting between two pieces of board to form capital negative boxes. They are certainly not adapted for use as nests of drawers.

Doubtless this will be considered a rather peculiar paper upon a peculiar subject, but I trust that my photographic readers will find the hints contained therein useful to them, and be the means of promoting tidiness in many ways about the dark room. The varied uses to which such nests of drawers can be put, I will not venture to mention. One thing is certain: that once made and placed in position, the drawers will speedily prove of service—in fact, my only objection is that so many things get hoarded that might well be dispensed with; but still, that is no excuse for having an untidy dark room.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

120.—Electric Light Installations.

This book—"Electric Light Installations and the Management of Accumulators"—has already arrived at the position of an acknowledged authority on the subject of which it treats. There is no occasion, therefore, to say more than that it is the sixth edition of a practical handbook on electric lighting and all that pertains to it by Sir David Salomons, Bart., M.A., Associate of the Institution of Civil Engineers, and Vice-President of the Institution of Electrical Engineers. In its present form it will be found to have been revised and considerably enlarged. Its price is 6s. It forms the first volume of Whittaker's Library of Arts, Sciences, Manufactures, and Industries, and is published by Messrs. Whittaker and Co., White Hart Street, London, E.C.

121.—Photography for Architects.

In "Photography for Architects," Mr. F. W. Mills, Member of the Camera Club and the Huddersfield Photographic Society, and author of "The Art and Practice of Interior Photography," has produced a most useful book, showing in detail the practice of photography from the architect's point of view and the advantages which would accrue to members of the profession from an elementary knowledge of the art. Everything that is absolutely necessary, including processes for copying tracings, is touched on briefly, but sufficiently for all practical purposes. The illustrations are good and to the point, as an inspection of two views of the south front of York Minster—one giving the result when the swing-back was not used, and the other when the swing-back was perpendicular—will clearly show. The book, which is well and tastefully got up, is published at 2s. 6d. by Messrs. Iliffe & Son, 3, Bride Street, London, E.C.

122.—The Cabinet-Worker's Handybook.

This is the latest volume of "Lockwood's Series of Handybooks for Handicrafts," written by Mr. Paul N. Hasluck, and published by Messrs. Crosby Lockwood & Son, 7, Stationer's Hall Court, Ludgate Hill, London, E.C., at 2s. It is, as stated, a practical manual, embracing information on the tools, materials, appliances, and processes employed in cabinet work. Mr. Hasluck gives, in his description of a portable bookcase, an excellent contrivance for a folding receptacle for books, which will pack into a small compass. The idea—which, I think, first saw light in an American contemporary—has been elaborated and extended by Mr. G. H. Blagrove in his paper on "A Portable Folding Bookcase" in Vol. II., page 217, of WORK.

123.—Calvert's Mechanics' Almanack.

This excellent "workshop companion," which, in the present issue for 1891, has reached its eighteenth year of publication, should be in the hands of every artisan, whether professional or amateur. The price is not stated on it, but, if I remember rightly, it is 4d. This, however, readers can ascertain for themselves by writing to the publisher, Mr. John Calvert, 99, Great Jackson Street, Manchester. In addition to the usual almanack matter, it contains much practical, technical, and industrial information, hints, recipes, etc., valuable to all artisans and handicraftsmen, but particularly to those connected with the building trades and engineering.

124.—"The Young Fretworker."

Messrs. Henry Zilles & Co., publishers of "The Amateur," and dealers in every kind of tool, appliance, and material required for fretsawing, carving, and other kinds of ornamental wood-working, have sent me from their house of business, 24 and 26, Wilson Street, Finsbury, London, E.C., their Supplementary List No. 42 for Catalogue No. 39 (cancelling Lists Nos. 40 and 41), with reproductions in miniature of several of their newest fretwork designs, and a new book, "The Young Fretworker," published at 2s., and containing twenty-four easy, but very pretty and tasteful, designs for beginners. The patterns—which embrace a wide variety of subjects, including photo-frames, silk-winders, brackets, baskets, key-boards, pen-racks, thermometer-backs, mats, easels, watch-stands, book-slides, pen-boxes, album-covers, cabinets, etc.—are noteworthy for the careful way in which they are drawn and coloured. They are just the thing to put into a boy's hands who has just acquired his first fretsaw or fret-machine.

125.—Catalogues, Serial Publications, etc.

Charles Nurse & Co.'s Price List.—Messrs. Charles Nurse & Co., 182, Walworth Road, London, S.E., send their "Enlarged Illustrated Price List of Tools" of all kinds made or sold by them. It has the advantage of being alphabetically arranged, so that any particular kind of tool can be looked up at once without the trouble of hunting for it from beginning to end of the catalogue.

"**The Machinery Market and Importer,**" published at 181, Queen Victoria Street, London, E.C., will be found useful as a source of information and advertising medium by all who use or are interested in machinery. THE EDITOR.

SHOP:

A Corner for Those who Want to Talk It.

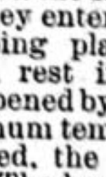
*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Questions and Answers in "Shop."—J. F. (*Ahoghill*) writes:—"I do not altogether like the way the questions are answered in 'Shop.' If questions were answered in such a way as to render information to all readers interested in the subject, the value of WORK would be greatly increased." [Our correspondents and authorities are again requested to note this, and to frame the question and answer so as to be intelligible to others beyond the original querist.—ED.]

Incubator with Self-Acting Regulator.—LEGHORN writes:—"As one who has had some experience in making and working incubators, perhaps I may be allowed to criticise the article on this subject which appeared in No. 89. The machine described is a very old-fashioned arrangement, dating back, I should say, to the construction of its original in 1882. It may work, but according to my experience it is weak in its vital points. The regulator is very crude, and I very much doubt its capacity to keep the machine at anything like an uniform temperature. A regulator should control the heat in the egg chamber, and not in the tank, as various agencies might be at work to cause the heat in the former to vary, which would not affect the latter at all. The flue-pipe would be much better constructed the shape of a T, thus—



the lamp chimney entering at B, and the damper being placed over A, where it would rest in its normal position, being opened by the regulator when the maximum temperature, 103° to 106°, is reached, the surplus heat then passing straight away. The lamp-box is quite unnecessary, care being taken to place the lamp under the centre of flue-pipe. The damping arrangement is next to useless. The writer says, 'place cold water in the tray.' Now, as the heated air will not descend, it follows that the water will never get hot enough to moisten the air—in fact, if boiling water were placed in the tray it would be cold in less than two hours, and the eggs would want constant sprinkling, and towards the end of the period of incubation a good soaking each day in water heated to about 100° Fahrenheit, to get any result at all, except spoiled eggs. Now with regard to tank. Writer says, 'use copper or tinplate (zinc is unsuitable).' As to copper I have not a word to say, it being by far the best material; but let me warn anyone against using tinplate. It will be sure to rust and leak in a very short time, and is likely to give endless trouble. If copper is too expensive, by all means use zinc. I would advise a lamp to be used to supply the heat, as although gas gives less trouble, you cannot be certain that it will not be turned off for repairs to mains, etc., in which case, if not noticed, it would be all U P with the batch; therefore my advice is, use oil. As to Mr. Walker's concluding remark (I presume he is referring to his own machine), I can well imagine he speaks feelingly, but from the fact that there are machines on the market which can and do hatch 90 to 95 per cent. of fertile eggs placed in them, I can (speaking from my own experience) confidently say that incubation by machines can be made to pay well. I have floundered through the experiences of hot-water machines, and have now given them up in favour of those on the hot-air principle. By the Editor's permission, I may, at some future time, describe a simple atmospheric machine, if sufficiently interesting to our readers. A useful rule for finding the egg capacity of any box or drawer may not be out of place. Square its size in inches and divide by four; thus, say a box 12 in. by 12 in.: 12×12=144÷4=36 eggs."—[Thank you for your able criticism. In WORK it is sought to go upward from tolerable to good, from good to better, and from better to best. The difficulty generally is to make a beginning on any subject, and to find a writer who can and will write on it. As soon as the beginning is made by someone who knows something, criticism is drawn out from someone who knows more on the subject, and thus, by its ventilation, the readers of WORK are put into possession of information which, in all probability, would never have been theirs had not the inferior appliance been described first.—ED.]

Toy Balloons.—F. S. (*Normanton*) writes:—"On looking through No. 90, Vol. II. of WORK, page 618, I saw that E. B. (*Liverpool*) wanted information on how to make the above. I think I could give him some information on how to make same. The balloon should be made of silk or taffeta—of course, shaped like a pear; in fact, the best model would be to take one and divide it into about sixteen slips, one of which will serve as a guide for cutting out the material for the balloon. When you have cut all the slips you must sew them very neatly together, leaving the last one open. When this has been done, soak the whole in drying oil. When you have done this, you must place a piece of brown paper over each seam on the inside of the balloon, so that there will be no holes left for the escape of gas; pass a hot iron over them several times, which will make them stick firmly to the oiled silk. When you have done this, you must give the balloon a coat of varnish, which you can make in the following manner:—Take a pound of bird-lime and half a pint of drying oil, put them into an iron saucepan over a slow fire, and let them boil for about three-quarters of an hour; when the bird-lime ceases to crackle, put in some more drying oil, enough for the size of your balloon, and and let it boil an hour longer, stirring with an iron spoon. Mind you do not let it boil over, and have some wet rags handy, in case it should take fire, to clap over the saucepan and extinguish it. When the varnish separates into threads when rubbed between two knives, it is

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ready for use; take it off the fire and add a little turpentine to it, let it cool till lukewarm and then apply it to your balloon with a brush. The balloon should be stretched out to do it properly. It will take about twenty hours before it is quite dry. You can make a net to cover the whole of your balloon, which must terminate in a cord going round its lower portion, and from thence cords must hang to suspend a light hoop, which must hang a little below the balloon; and from this hoop other cords must hang to support a car, which can be made in the following way:—From a sheet of stout cardboard or millboard (if your balloon is large) bend the four divisions back, put some glue on the little tongues and stick them all together, and paint any colour you like, and then suspend it from the hoop previously hung on the balloon. To fill the balloon with gas, which must be made in the following manner, put into a large bottle or jar a pound of iron filings and two quarts of water; to this add little by little one pint of sulphuric acid. Stop the bottle with a cork, insert a glass tube into the bottle, making a hole in the cork, and place the other end in the neck of the balloon. You will soon find that the gas which has been generated in the bottle from the decomposition of the water will soon fill the balloon. When this is done withdraw the tube, and tie the balloon neck very tight, and then set it free. The cost will be according to the size."

Toy Balloon Car Plan.

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Picture-Frame Making.—M. E. M. (*Heywood*).—An article on this subject appeared in Vol. I., page 71, of this Magazine, and if you consult the Index, which you can obtain of any bookseller or newsagent for one penny, you will find that frequent references have been made to it in "Shop." Another article on picture-frame making is in my hands, and will appear in Vol. III.—ED.

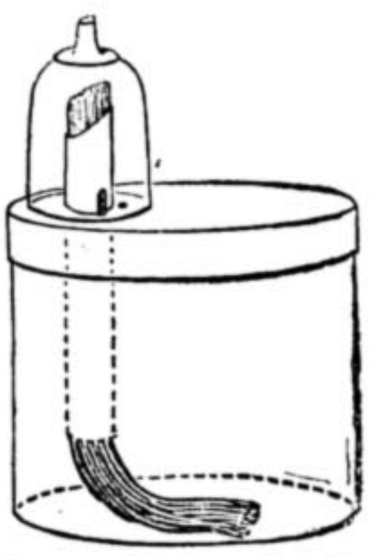
Improved Method of Lighting Fires.—H. G. (*Dewsbury*) has hit on an improved method of fire-lighting, and asks advice as to whether it would be desirable to patent it. To speak candidly, we do not think that it would. Many persons may like his plan, and adopt it; yet (assuming that the Patent Office allows his idea to be so far original as to grant him protection) it is hard to see how he would be able to defend his rights from infringement. There is no special apparatus to be manufactured on which he might levy his profit; and if people think proper to use his plan in their houses without his permission, he can scarcely enter private dwellings to enforce the payment of a royalty. If (as is decidedly the case) we do not recommend a patent, H. G. gives permission for his plan to be made known to the readers of WORK. For this he has our thanks. His method is only applicable to houses where the gas is laid on. He has a rubber pipe, so long as to reach from his gas-burner to his grate, and at the end of this he has a copper tube, 2 ft. long. He puts the end of his tube into the grate, covers with coal and coke, turns on the gas, and lights it, and in from ten to fifteen minutes is *certain* of having a good fire. He has tried closing the end of his tube and punching it with holes, but finds that the open pipe answers best. He claims for his method that it is more cleanly, more expeditious, and that it involves less trouble than any other.—C. C. C.

Bird Cages.—TOM LIVINGSTONE.—I am glad you are pleased with the article, "Bird Cages, and How to Make Them." With the permission of the Editor, I should be delighted to give instructions for making the cages you have stated in your letter (linnet, goldfinch, canary, lark, blackbird, etc.). But at the same time, as you can procure them ready made so cheap, I think it would not be worth while, unless you intend to make them for sale. The traps I would rather not describe, as I love to see the wild bird free, and would not cage them in small cages. I am preparing a paper on "How to Make an Out-door Aviary," which I hope will appear in an early number of WORK.—F. H.

Elliptic Arch.—D. M. (*Inverness*).—Whether carpenters have a rule which they follow to obtain an ellipse or an elliptic arch, I am unable to say. I doubt whether they have; it is seldom that workmen of any kind will follow any particular rule to attain a certain result. If such were the case, we should not now be surrounded by so many improvements in various branches of trade and art. A fixed rule may be taught to the apprentice, as to the schoolboy, but if he is at all aspiring, he soon finds a way of doing things in an original manner. A most handy method of striking an elliptic arch is to follow the instructions given by G. R. in No. 41 of WORK, Vol. I., page 652, for striking an oval. Of course, half the oval, lengthways, will give you the arch. Another method, and one which is simpler even than this and many others, and more preferable if you require to strike many elliptic arches, is described by me in No. 59 of WORK, Vol. II., page 106. It is, as some of our friends would say, "my own idea," but it is probable the same idea has occurred to others: this does sometimes happen, and seems to be a special penalty of Providence to counterbalance the conceit we are always liable to indulge in when possessed of "a new idea." The *circular* board (card or wood) should be mounted lengthways; and, as I there state, can be so regulated when placed between a light and the object to be drawn upon, to throw a shadow upon the latter of any size or proportioned oval; the top half of which will give you what you require. Of course, this process requires a tolerably steady hand, and unless you possess this, try first the method mentioned by G. R.—J. S.

Wood for Furniture and Designs in WORK.—OXIDE.—It always gives us pleasure when our efforts are recognised in a complimentary manner. All the designs I have contributed to WORK are original, and the readers of WORK are the first who see them, excepting, of course, if I am bound to speak strictly logically, the Editor, myself, engravers, and a few private acquaintances who may happen to come into close contact with me. None of the articles are thus, naturally, made previous to their appearance in WORK. I am in the habit of making small rough working models of the things, and these, in addition to practical experience in mixing among professional workmen in different branches of cabinet work, enable me to give our readers something of a combined or folding character which will be workable, useful, and sometimes ornamental. If you wish to have a "combined work-table and escritoire," and a "novel coal and coke box" (appearing in Nos. 56 and 58 respectively), and you will allow me to correspond with you privately, I will put you in communication with one or more skilled *professional* workmen, who, I have no doubt, would turn out two good jobs. Of course, you could take the designs to a first, second, or third-class furnishing establishment, but as the goods would have to be specially made, the sums they would charge you (more so in the last of the three cases, contrary to supposition) would be exorbitant. Believe me, I do not wholly appreciate the disestablishment of the middleman, but the percentage some firms charge upon the actual maker's return for his labour, is such as to lead one to think that cabinet makers can earn excellent wages. This is not the place to discuss such a question; but I may say that I have seen poor, but skilled, master workmen filling the pockets of men whose only recommendation was that of a connection with the "upper ten." Of course, this does not apply to all firms; and I may be regarded as making a rather innocent accusation by intimating that it applies more so to second and third-class firms, because *every* firm considers itself *first-class*. Some of our amateur friends may see this, and believe there is an opportunity open for them to make a bargain. But let me say that I should only recommend first-rate work; and anyone who thinks there may be a chance for him, can communicate with me through the Editor, with his permission.—J. S.

Jewellers' Soldering Lamp, Forges, and Furnaces.—K. W. (*Mildmay Park, N.*).—It appears to me that a wrong article is asked for, but in case it really is a forge that is desired, I think it best to mention that the leading makers are Thos. Fletcher and Co., of Warrington. London address, 77, Queen Victoria Street, E.C. If it is a soldering lamp that is required, a good one, which gives quite enough flame for ordinary mouth blowpipe work, can be obtained from Calipe & Co., 19, Poland Street, W., for 3s. 6d. This new one is called the "Hydrostatic Soldering Lamp," and they have some small bills describing and illustrating it, which can be obtained on application by post or otherwise. It appears, though, as if R. W. wishes to make something himself, so I will describe the simplest way I know to make an effective soldering lamp, methylated spirit being the material that supplies the heat. The sketch gives the appearance of the article, and it is made up in this way: A sound tin canister with well-fitting lid is obtained (one of Van Houten's cocoa tins holding 1 lb. will do, if lowered to half its height); then through the lid a piece of ¼ in. brass tube should be pewter-soldered in the position shown in sketch—this is, of course, to hold the wick, and to regulate the height of that, it would be well to cut a slot in the tube, large enough to work a pin up or down, as the wick is desired to be either raised or lowered. In the lid also, about ½ in. from the tube, an air-hole should be made. The lid is not to be fixed, as it will have to be removed when the lamp is being filled. Over the burner and the air-hole there should go a cap, which is to act as an extinguisher, and to prevent the evaporation of the spirit. If one can be made to fit over a bezel, or be screwed on, so much the better, but a footless wine-glass will answer pretty well. As to the use of charcoal, use it by all means as a support for your work while soldering, but do not make a fire with it, and try to solder with that; if you do, there will be trouble in store for you, for the reason that the heat from it is not sufficiently under control. In soldering jewellery, where solders are used that are nearly the same quality as the article to be soldered, it is necessary that one should be able to stop the supply of heat, or to vary its quantity and direction instantaneously. From this you will gather that it is only in exceptional cases such a furnace or forge would be used for making jewellery. I find that I have not mentioned the wick to be used. It should be "loose" wick, but nearly any sort will do, providing it does not fit too tight.—H. S. G.



Home-Made Spirit Lamp for Soldering.

Rubber Stamp Accessories.—BUYER.—I cannot give you the names of the actual makers of the accessories required, as they are for the most part made abroad, and consigned to the wholesale dealers in this country for distribution. H. Savage, 38, Cheapside, London, E.C., and M. Lindner, 170, Fleet Street, London, E.C., are two of the largest dealers, and either of them would probably supply you as cheaply as the actual makers.—QUI VIVE.

Silvering.—A REGULAR READER.—If the pier glass is a valuable one, I would strongly advise you not to attempt to resilver the places yourself. It is extremely difficult for an amateur at any time, but more so in this case, as it would naturally get dirty where it has worn off; and before it is resilvered it must be made perfectly clean, or it will show only too plainly when finished. If you will take my advice you will show it to a professional, and be guided by his advice. I do not like to say the least thing to discourage an amateur in anything he wishes to do, but I should not like you to spoil your glass. If, however, you are still determined to have a try yourself, kindly refer to my answers to C. H. G. in "Shop," No. 83; also other answers in back numbers. You can then easily adapt the information to your own case, the materials used being the same in both cases.—W. E. D., JR.

Electric Gas-Lighter.—J. N. (*York*).—I can only guess that you have a small battery and coil, of which the battery is out of order, and needs recharging. The carbon-plate may be renewed with one of ordinary carbon. You may charge the cells with sal-ammoniac dissolved in water, as much of this as the water will take up, then add ½ oz. of chlorate of potash to each pint of sal-ammoniac solution.—G. E. B.

Voltmeter.—W. M. (*Hereford*).—Mr. Bottone is quite right. To measure the voltage of the current, it is necessary to keep back by high resistance the volume of the current. These resistances may be included in the fine wire wound on the voltmeter coil, or added outside the instrument. The resistance does not act on the needle, as you suppose, but it acts on the current to pull down its volume. If you look again at my reply to CYMRO DEWI, on p. 633, Vol. II., you will see that the bridge of wire must be of "fine brass or German-silver wire." This in itself offers a high resistance, and pulls down the current volume. To the words "any number of volts," please add "up to five," as the range of this "makeshift" is small.—G. E. B.

Electric Clock.—ELECTRIC.—The secondary clock is simply a dial with two hands in front, and a ratchet movement worked by an electro-magnet behind the dial. The ratchet is so constructed as to move the long hand one half minute, or one minute forward, for each cog of the ratchet-wheel released or engaged. The armature of the electro-magnet forms part of the ratchet pawl, and is attracted to the magnet every time contact is made by the mechanism on the driving-clock. I regret that I cannot now make the drawings to show you the various parts. Perhaps some other contributor, better acquainted with clock mechanism, will oblige with drawings of electric clock works.—G. E. B.

Polishing.—H. S. (*North Kensington*).—Do not be too much discouraged by your partial failure in getting good results with polishing. The cause, probably, lies more in your want of practice than in not having a good filling—at least, if you have used the one which I have several times recommended in "Shop" columns. If you read these regularly, you will get many hints which will be valuable to you. To help you more specifically, however, and endeavour to remove the difficulties you suggest in your letter: (1) I presume you object to the end grain of the dovetails showing up when polished, but I do not see why you should. Of course, a mitred joint would have looked better, but having made a plain dovetail you need not be ashamed of it showing. Any attempt to hide it by painting would probably spoil the work. Yes, certainly a lot can be done by varnishing and rubbing down with pumice powder, but then that kind of work is not French polishing, as if you want this you will not do right by adopting the easier method. Otherwise, when well done, it is quite as effective as badly done French polishing. I do not see where your difficulty about polishing stained wood comes in. If you rub down with glass-paper, you will not spoil the stain if you use fine enough paper, and do not rub too much. (2) Your question, "How to tell when the oil and polish have lost quality?" is not an easy one to answer, for they may be spoiled in so many different ways. I should say your best plan when you suspect anything wrong is to show the materials to a competent French polisher or oilman. (3) There is no difficulty in getting a fretwork pattern to adhere sufficiently for all practical purposes to polished wood. You can wash the paper off afterwards. Don't you think you might have tried this on your own account, instead of making imaginary difficulties? Instead of sticking the pattern on the wood, trace it with a hard point. This will mark the polish sufficiently for you to saw to. (4) No; the spirit rubber should be tolerably dry. If you have it too wet, you will simply wash off the "bodying-in" or polish instead of just glossing it. (5) No, you should have no oil on the spirit-rubber. (6) Of course, it is practicable to either varnish or polish your chest. (7) For the small hinges you want try any of the fretwork dealers.

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If you cannot get the exact size you want, you will have no difficulty in getting something near it.—D. D.

Emery Wheels.—MOTO.—You cannot make your "emery dust" into "oil-stones," but you might be able to utilise it by making small emery wheels or "slips" by amalgamating it with shellac. This operation is generally supposed to be beyond the reach of amateurs, but I have been rather successful, and have many home-made wheels which I find most useful, and I have given the result of my experience in a short article in this Magazine which you will find at page 370, No. 24, Vol. I., and to which, on account of the pressure on our "Shop" columns, I must now refer you.—OPIFEX.

Incubators.—J. H. (*Liverpool*).—You appear to have mixed up two different plans of incubator. J. T. R.'s directions are very clear, and on the point you raise as to the position of the ventilating tubes, he says (page 651): "Four ventilating tubes (¼ in. lead pipe does very well) should be placed, one at each corner, to be bent under tank, and project ½ in. above top of casing." I cannot improve on the clearness of this, but would advise you to work entirely by J. T. R's plan, or else work entirely to some other plan. You must remember that there are two systems, one in which the lamp is expected to do all the work, the other in which, as J. T. R. says, "the heat" is "kept up by periodical fillings of hot water."—B. A. B.

Iron Houses.—CONSTANT READER.—Write to Humphreys, Knightsbridge, London, S.W.—D. D.

Lathe.—ECONOMY.—I fancy you will be able to do all you want in the way of grinding with an emery wheel. Write to the Britannia Company, Colchester, for sizes and prices, and then see which will suit you best.—D. A.

Fret Saw.—E. J. H. (*Stoke Newington*).—If the machine you refer to is too complicated for you, I really cannot advise you to undertake the construction of any other kind, as I do not think it would be possible to devise anything simpler. Why not be satisfied with the ordinary hand frame? It is far better than any but a first-class machine, which it would cost you less to buy ready made than to make yourself.—D. A.

Inlay Table.—A. C. (*Ladykirk*).—As the piece of veneer you require is so small, it is not worth your while dyeing a piece. Your best plan will be to inlay with some white wood and match it up in the polishing. Very often, small bits which have to be inlaid when repairing, can be tinted better by painting with ordinary water-colours than by any other means. Try the effect on a bit of waste veneer first, so that you may not spoil any that is inlaid. To give precise directions as to colours to be used is, of course, impossible without seeing the work to be painted up to.—D. A.

Watering-Can Paint.—TINMAN.—If the paint looks too dull when dry, varnish it. Surely you could get the oil and colourman who supplies you with paint to mix you something which will not dry dead. I suppose the enamel paints so much used are too costly for your purpose, so I do not recommend them; but if I am wrong in my supposition, you will find the Foo Chow enamel the very thing. It dries in a few minutes with a glossy surface.—D. A.

Window Mist.—W. Q. (*Liverpool*).—When gas is burnt, water in the form of invisible vapour is formed. This, if it meets some cold surface, condenses into water. In small or ill-ventilated shops, which are generally warm, this vapour condenses on and runs down the windows, which are kept cold by the outside atmosphere. In large and better ventilated shops, the temperature on either side of the windows is not much different, and there is no reason why the vapour should condense there more than anywhere else; so it remains suspended in the air. There is no real cure for your case, but the following is often beneficial:—Clean the windows as usual, and then wash them over with a solution of carbonate of soda (about 1 oz. in a gallon of water). Allow this to dry on the glass, and, when quite dry, polish with a dry cloth.—F. B. C.

Alloy.—W. J. (*Newcastle-on-Tyne*).—I do not know of any alloy with the properties you mention. Those of mercury are very soft, some even liquid, but melt at a lower temperature than boiling water. Speaking generally, an alloy melts at a lower temperature than any of its constituents, thus:—Common solder, an alloy of equal weights of lead and tin, melts at 335° (Fahr.), whilst the melting-point of tin is 442° (Fahr.), and that of lead is 620°. Calin, the alloy used by the Chinese for lining tea-chests, is but little harder than lead; its composition is:—Lead, 126 parts; tin, 17·5; copper, 1·25; and a trace of zinc.—F. B. C.

Silver-Plating Chains, Lockets, etc.—SEQUAH.—Three articles giving full instructions on this subject are in hand.—G. E. B.

Electric Night-Light.—H. B. C. (*Sunderland*).—The small box battery described and illustrated on p. 592, Vol. II. of WORK, will supply current to a small electric lamp to be used as a night-light. You would find the battery recommended for photographic dark rooms more suitable for the purpose. Five or six cells of the patent Gassner dry battery are most suitable for lighting small 2½ c.p. 6 to 8 volt lamps used as night-lights in a bedroom, as there are no liquids to spill, nor any fumes given off in working the battery. Carbons for batteries are sold at a cheap rate; it will never repay you to make them yourself.—G. E. B.

Camera Bellows.—TOM.—It will be well to make a pattern in paper, so that when the more expensive material is being used, it may be worked up without hesitation, and the folding and unfolding that would inevitably damage it. Procure sufficient black lining and leather (morocco is best) for the size of the bellows you contemplate making. We will suppose you have cut out a rectangular piece of lining that, when folded, will be of the right dimensions. Upon this attach, with strong bookbinders' paste, the leather, which has been previously rendered limp by damping. Wherever it is necessary for the leather to overlap, it should be shaved sufficiently thin with a sharp knife to make the two thicknesses equal to the rest. Before this gets quite dry, proceed to fold it fan-fashion, each fold to be 1 in. in depth, as in Fig. 1. Then keep pressed together until dry. I omitted to say that before creasing, the position of the folds should be marked with a chalk pencil, as in Fig. 2, as it will save some trouble afterwards. When the material is nearly dry, fold it the contrary way—four sharp creases, as the lines B, B, B, B, to form the corners of the bellows. Now open it out and securely push together the two ends of the strip in

FIG. 1

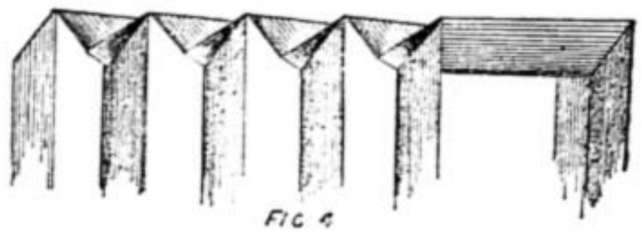


FIG 4

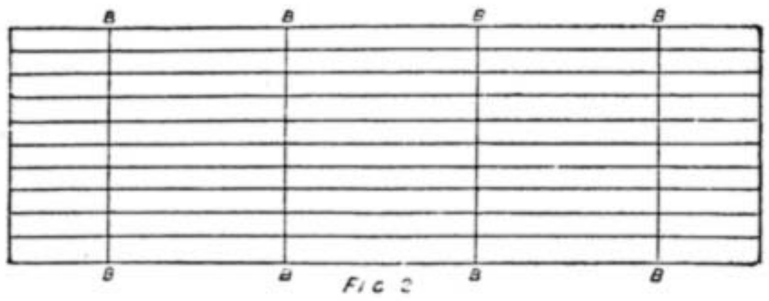


FIG 2

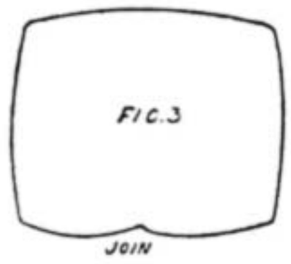


FIG.3

JOIN

Camera Bellows Parts.

the centre of one side in preference to making the join at one corner. There will now be formed a cylinder, as in Fig. 3, consisting of leather outside and lining in. There remains nothing to be done but pressing the cylinder into shape with the fingers and thumb. The corners will be the only part likely to give much trouble, and must be pinched up, as in Fig. 4. All the corners being finished in this manner, press together and let them remain till absolutely dry to make the folds retain their form. When dry, work the bellows backwards and forwards to get pliability, and the thing is complete and ready for attachment to the camera frame. It must be borne in mind that the space inside must be equal to the size of the plate to be used, which, if the folds are 1 in. in depth, will necessitate an outside measurement of an inch larger each way, so that the fold will not cut off the light from the plate when in use, and only slightly extended. Half an inch or so must be left for joining up.—D.

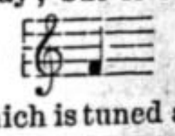
Charging Porous Cells of Leclanché Battery.—W. G. (*Erith*).—If the cells are clean, and have never been used, you may utilise them as porous cells for a Leclanché battery, by charging them to within ½ in. of their tops with a mixture of equal parts granulated carbon and granulated binoxide of manganese broken to the size of peas, and sifted free from dust. The carbon plates should have lead heads cast on them, each head holding a binding screw embedded in the lead. The heads, and a narrow line below them, should be painted with Brunswick black whilst still hot. Pack the mixture closely around the carbon strips and shake down well, then seal the tops with a mixture of pitch, to which has been added one-third part of beeswax melted together. The small bits of glass tube are merely ventilators to the cells, and can be thrust a little way down into the charge of the cells before pouring in the hot sealing mixture. Paint ½ in. of the tops with Brunswick black when the cells are charged and sealed. If the cells have been used for other purposes, they are useless for this purpose.—G. E. B.

Model Electric Light Battery.—CRUDE ELECTRO.—The tang of the brass screw cast into the zinc plate passes up through the cover of the battery box, and is secured on the upper side by a brass nut. This also grips a copper strip as shown at Fig. 5, page 593, Vol. II. of WORK. The copper strip thus connected to the zinc of one cell is also connected to the carbon plates of the next cell by a brass screw passing through the copper strip and the wood cover into the lead collar in which the carbons are embedded (as shown at Fig. 1). This forms a connection between the two cells instead of a wire. The screw should not touch the carbon plates. The copper strip is not continuous; this is clearly shown in the drawing at Figs. 5 and 7. Of course, you cannot see all the parts in one figure, but must understand that they are parts of one whole cover, seen above, below, and through in section. The collar of hard wood, ebonite, or gutta-percha, fits on the screwed tang of the zinc plate (as shown at Fig. 8) to insulate this from the lead ring holding the carbon plates. I think I stated clearly that the chromic acid solution was strongest and fumeless. Kindly read the article again carefully.—G. E. B.

Onion Net.—J. B. (*Belfast*).—Turn up No. 79 of WORK, and read the article on "How to Net a Garden Hammock." If the net is intended to hold very small onions or shallots, the meshes should be only ½ in. across, and you will want a small needle and small mesh stick. But, if the onions are large, the meshes may be made as large as hammock meshes, and with the tools described in the above-mentioned article. Three-fold twine, a little smaller than whip-cord, will serve for the material. First, net a ring of meshes large enough to form the mouth of the bag, and net the two ends together to form a ring. Put a piece of stout string through this, and loop it over some support, then proceed to net the remainder of the bag by making meshes round and round in ever-increasing rings, until the required depth has been obtained. If you wish to increase the diameter of the bag from the mouth downward, as shown in your sketch, it will be necessary to put two meshes in one opening here and there as you go on, and thus enlarge the diameter of each ring of meshes. To decrease the diameter, you must take in two or three meshes in a ring. As the bottom of the net is neared, decrease the diameter more rapidly by taking in every alternate mesh. Run the needle through the last few meshes, and draw them all together, then take a few half hitches around the twine, and pull them tight to finish off the net.—G. E. B.

Incubator.—SWANSEA.—If you refer to the illustration again (see page 589, No. 89), you will see that the well-hole does not reach to the bottom of the tank—a space being left to allow the water of tank to freely enter and return. The float is simply an air-tight vessel, with a central wire working in a guide; the size of this is immaterial, as its rise and fall is not according to its size, but to the level of water in the well. A convenient distance would be about half an inch clear of the well sides.—C. M. W.

Mechanical Help in Making an Invention.—A. B. (*Manchester*) is not very explicit as to the exact nature of the help he requires, but it would appear to be in cutting slots in metal plates to admit the pennies in his new spirometer. Surely in Manchester he might find some working machinist who would do this under his own eye, and without involving cost of carriage? We should advise him to look there for such a person. The workers whom we should recommend as the best we know for carrying out *novelties in metal*, are in the Midland manufacturing districts. He might apply to Mr. H. J. Cook, "Proved" Works, Crabb's Cross, Redditch; or to his brother, Mr. Wm. Cook, steel tool-maker and improver, Headless Cross, Redditch. We have every reason to believe that he will find them to be practical, clever, and trustworthy men.—C. C. C.

Dulcimer.—H. J. C. (*London, N.*).—Yes, the lowest note is brass, the next steel, and so on, exactly as you say; but it is the lowest steel note that is tuned to  on the piano, not the lowest brass, which is tuned an octave lower, viz.:—

—R. F.

Crystoleum Painting.—W. A. H. (*Stockport*).—The advantage of two glasses is apparent when together with that having one. In painting a portrait, for example, the light tints are put on the photograph, and solid colour on the back glass, such as a dab of vermilion for the cheeks, deep colour of dress, etc., etc., and when seen through the thin photograph gives it a silky, soft, transparent effect; whereas, if the colour is dabbed on the photo., a dead colour is produced, and looks to me as though the portraits had rubbed their cheeks in Nature with black cherries, lips and face all run into one; all the soft shadows of the photo. seem to give way to the colour. That is the secret of those seen by you in the shops; the photograph is carefully sand-papered away, so that a very thin film remains, and the colour of the back glass reflecting through, gives the silky soft colour.—G. R.

Patent *versus* Registration.—L. G. (*Bradford*) will find registration sufficient; the smaller fee required for that purpose will be as much as he will be justified in spending. Being in wood, his invention will come under Class 3.—C. C. C.

Fret Machine.—F. G. S. (*Richmond Hill*).—The most likely machine to suit your requirements is the Empire Scroll Saw. It can be used for either light or heavy work, and will cut up to 3 in. thick; it has a swing of 21 in., and the usual table and drill, and judging from the cut, I should say that it was a good substantial tool. The list price is £5 5s. If you write

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to Messrs. Chas. Churchill & Co., 21, Cross Street, Finsbury, E.C., I have no doubt they will be pleased to furnish you with full particulars.—W. R. S.

Fret Machine Saw.—HOMERTON.—The saw you mention is not fastened to the wheel; neither has it an exactly vertical stroke. The arms are riveted to the framework (A). About an inch from the centre of the wheel (B) a small pin is fixed, which works in a slot of the arm (C). There is a small grooved wheel fixed under the table (D) to steady the saw when running; perhaps that is where you have got your idea that the saw is fastened to a wheel.—W. R. S.

Marking Patented Articles.—F. C. (*Bolton*).—Upon patented articles it is usual to put the word "Patent" and the No.; a patentee would not in any way forfeit his right to monopoly by neglecting to do this, but should he, under these circumstances, institute a prosecution, it is probable that a jury would award him no more than nominal damages.—C. C. C.

Wood Panels.—J. W. B. (*Lockwood*).—If you will purchase the Index to Vol. I. of WORK, you will find that much in the way of carving in wood has already appeared. In due time you will get more, but other subjects besides wood require to be treated. That part of your letter referring to coinage has been forwarded to the editor of the *Popular Educator*.

Self-Acting Fountain.—R.N.B. (*Teignmouth*).—That your fountain jet does not rise so high as it should is probably due to some restriction in the passage of the tap. A small hole in the plug of the latter, opening into the larger nozzle at top, reduces the velocity of the water. If you cannot overcome this, use what is called an "oil-can nozzle," to be obtained at most ironmongers. This has a conical way inside, and will produce the best effect, but, of course, it cannot be turned on or off.—C. M. W.

Aquarium Cement.—J. P. (*Manchester*).—If you have glazed your aquarium with Portland cement, you will have some difficulty in getting it sound at all; but leaks are not always due to the cement, but from improper construction.—C. M. W.

Fret Designs.—COALY TYNE.—You may obtain the designs you inquire about in this country by applying to Messrs. Churchill, Cross Street, Finsbury, E.C., as they keep the largest stock of American designs. If you cannot get them there, write to the John Wilkinson Co., 77, State Street, Chicago, U.S.A. The series you name is not the best.—D. A.

Varnishing.—NOVICE AT WORK.—You have omitted to give the kind of wood. If mahogany or any of the darker woods, the best finish is French polish; next to this varnish. Oiling will do very well, particularly for oak. If you leave the work in the white, or, as you call it, bare, it will have an unfinished appearance, unless you have used white holly-wood, which will certainly not be improved by either oiling, polishing, or varnishing.—D. D.

Violin.—G. A. (*Liverpool*).—The most celebrated name is undoubtedly Antonius Stradivarius. You should consult some standard work on the subject; there are plenty of them. "Old Violins," by J. M. Fleming, is an interesting book, and contains some useful information.—B.

Vertical Boiler.—J. D. (*Grimsby*).—You should advertise your boiler in our "Sale and Exchange" column.

Book on Wire Working.—PANEL.—I am not acquainted with any good book on wire working that would be of use to you as a professional. I have, however, in my hands a series of excellent papers on the subject, well illustrated, which I think will just meet your requirements.—ED.

Outside Sitting- or Smoking-Room.—J. W. (*No Address*).—The sketch and particulars are not sufficiently explicit. Send the size you wish the room to be, and the amount of money you are prepared to spend on it, also what you think of covering it with, both inside and out, and the size of garden, with the position you want the room to occupy, bearing in mind that if you have a "next door neighbour" he may object. Say if it is to lean against any wall, or stand independent; also, do you propose warming and ventilating it, and how?—E. D.

Cleaning Terra-Cotta Bust.—F. W. E. (*Woolwich*).—Make a tolerably strong solution of American potash, and mix sawdust with it so as to form a kind of poultice. With this cover up the bust for a night, and it will probably be found that all paint, grease, dirt, etc., will then wash off with cold water; if, however, the incrustation should be obdurate at any part, the process must be repeated.—M. M.

Wooden Tricycle.—E. McM. (*Armagh*).—Your correspondent wishes to construct a wooden tricycle. I should hardly advise him to do so. There is no good reason why a home-made tricycle should not be made of wood, so far as concerns the framework, but I should never advise making wooden wheels. This would be going back to the old bone-shaker, with its iron-shod tires; besides, the wooden wheels are more difficult to make than wire spoke ones. I should advise E. McM. to go in for making his tricycle all iron and steel in the usual manner, even if it entails calling in the help of a mechanic. If, however, he insists upon having a wooden-framed tricycle, he must state the kind of machine he means; whether front or rear steerer, whether side or bar handles. I will be happy to furnish him with a sketch of a simply made machine free of cost if he sends his address. Mine is with the Editor of WORK.—A. S. P.

Fret Machine.—ECONOMY, W., AND OTHERS (*Inverness*).—Particulars for converting a sewing machine into a fret machine appeared in No. 56, Vol. II., page 57; and No. 60, Vol. II., page 128.—W. R. S.

Electric Light Installation.—INSTALLATION.—As you have omitted to give dimensions of your rooms, I cannot advise you respecting the number of lamps needed to light them. I think you will not get enough light from three 5 candle-power lamps in each room. These will absorb a little over ⅛ horse-power to keep them alight. If you have three 8 candle-power lamps in each room, you will need a little over ¼ horse-power. Steady lights are not obtainable from small gas-engines. Every explosion of the gas causes a flicker in the lamps. To get steady lights from gas-engines, these must be greatly in excess of the power required, and should be furnished with two fly-wheels. If you think of passing the current through an accumulator, this will mean an extra expense for plant and power, as you will have to provide power to charge the accumulator in addition to that required for the lamps. If you had a gas-engine and wished to utilise it in lighting your house at night with the electric light, I should advise you to proceed with your plans, but I cannot recommend you to attempt such a small private installation with the means at your disposal.—G. E. B.

Winding Voltmeter Coil.—HENRICUS NARPHENUS.—Wind on one ounce of No. 34 silk-covered German-silver wire, or three ounces of No. 36 silk-covered copper wire. If the inside needle is so pivoted as to enter the coil when current is passed through the instrument, make the needle of soft iron; but if the needle is so pivoted as to hang vertically in the coil when at rest, then make it of hard magnetised steel.—G. E. B.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Dynamo.—F. S. (*Normanton*) writes:—"Will any reader of WORK please tell me in 'Shop' how to make a small dynamo for two or three lights which I can drive with a motor I have made?"

Turbine.—J. L. (*Nelson*) writes:—"Will any reader furnish me with diagrams and instructions how to make a turbine of about one-man power and also the cost?"

Band-Saw Machine.—J. H. (*Sheffield*) writes:—"I am in want of a small powerful band-saw machine to work by treadle, carrying ¼ in. broad saw, and capable of cutting 1½ in. thick beech. Will any reader inform me whether there is such a machine, who are the makers, and about what is the price? The real work for which the above is required is the cutting out of saw-handles."

Cane for Chairs.—CANE asks for the address of a shop about Hackney or Shoreditch where he could buy sufficient split cane to re-seat half a dozen small chairs.

Bamboos.—A CONSTANT SUBSCRIBER writes:—"Will any reader of WORK kindly let me know how bamboos can be bent?"

Musical Skipping Rope.—R. H. (*Glasgow*) writes:—"I should take it as a great favour if any reader would kindly inform me if there is such a plaything as a musical skipping-rope; also where such a thing could be obtained, and also if patented?"

Gun Barrel.—C. D. (*Bury*) writes:—"I have a double-barrelled gun which I wish to re brown. Can anyone inform me how to do it?"

Electricity Classes.—APPRENTICE asks:—"Will any reader inform me where I can join a class for instruction in electricity—one that I could afford? I am an apprentice only."

Black Enamel for Metal.—F. A. E. (*Tufnell Park, London, N.*) writes:—"Can any reader of WORK give me the name of the enamel that the patent pen, No. 11,328, 1887, is coated with, and if it is used hot or cold, and the process?"

Artists' Canvas.—A READER asks:—"Can anyone inform me how raw canvas is prepared so as to produce a dull and very smooth surface for artists' use?"

Primary Batteries.—ELECTRIC wishes the co-operation of a gentleman amateur electrician to experiment with a discovery in lighting from primary batteries.

Screen.—A CONSTANT READER writes:—"I have made a draught screen for an invalid lady, and covered it with calico—height, 5 ft. 3 in., length, 5 ft. I think there must be a paper printed with a Japanese design that I could paste on. Any reader telling me where I can procure such, or suggesting anything suitable, will oblige. It must be cheap."

Engraving.—C. P. (*Wanstead*) writes:—"I should be glad if any reader will tell me of any easy way to engrave names on dog collars. I am sure it would benefit many of our readers just now, as the new Act is passed. It is rather expensive to put it in an engraver's hands to do."

Imitation Icicles.—F. H. S. (*Dover*) writes:—"Would any reader be kind enough to furnish me with details as to how I could make imitation icicles, not the ordinary cotton-wool ones, but transparent and lasting."

Newspaper Cart.—L. M. N. (*Liverpool*) asks:—"Will some reader kindly give sketch and particulars of little cart to carry newspapers, size about 2 ft. by 1½ ft. by 1½ ft. deep. Must be light and strong, to run on mail-cart wheels; also where to buy materials, wheels, etc., for it? Neighbourhood, Liverpool."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Oval Drawing and the Ellipse.—F. C. (*Leytonstone*), in reply to J. B. (*Wallington*) (see No. 89, page 599):—"I was quite serious in my letter in No. 84, and if J. B. will get the other numbers in which I reply to J. W. H. on the subject, and give the matter a little careful consideration, trying a few experiments, he will be convinced of the fact that for the past twenty years he has been 'working radically wrong.' I am much obliged for the few notes he sends, but I think he will find, on referring to back numbers, that Notes 1 and 4 have appeared before. I am afraid that Notes 2 and 3 (if correct) are not much to the point: *e.g.*, Note 2, 'The circumference of an ellipse is continually altering in its direction.' Now, suppose I take two sticks, and push them in the ground at A and B, Fig. 1. I then loop a piece of string round them loosely, forming a triangle, A, B, C. At C I tie a little dog, who at once proceeds to run round, keeping the string tight. A glance at the figure will show that the path of our little dog is an ellipse. Now, may I ask is he continually altering his direction? After a while he manages to get the stick at B out of the ground, and runs round (still keeping the string tight) in a circle, having A as centre. In the former case he was running round governed by two points, the *foci* of an ellipse, in the latter case by one. Now, I think you will admit that if his direction was continually altering in the first case, it was also in the second. If that is so, Note 2 applies to a circle as

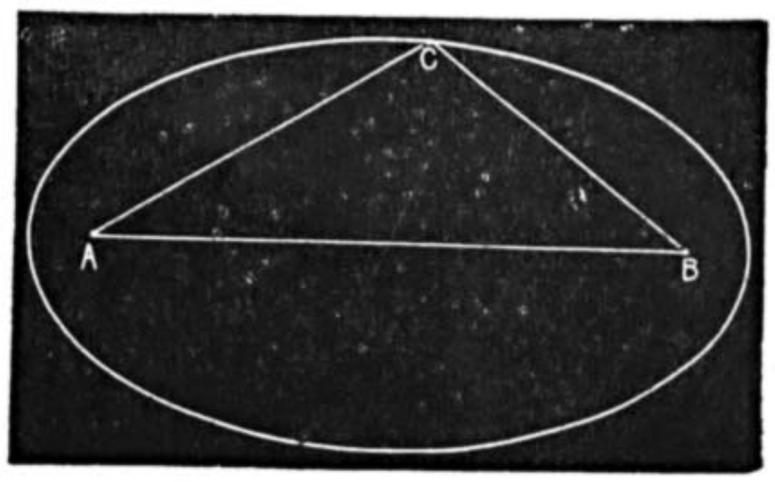

Fig. 1.—Ellipse and Triangle.

well as an ellipse—in fact, to any other curve; therefore it would be just as lucid to substitute for Note 2, 'an ellipse is not a straight line.' Now we will take Note 3. 'The *foci* (is that Latin or Greek?)—suppose we call it focus of an ellipse—is the exact geometrical proportion between the two circles, which may be struck on the transverse and conjugate diameters of an ellipse.' We use the term *foci* because there are two of them: focus is the singular, foci the plural. Each focus is a point illustrated by the sticks in Fig. 1, and as a point simply denotes a position, and has neither length, breadth, or depth. How is it possible for a focus to be the exact geometrical proportion between two circles? What two circles? Any two may be struck on the axes of an ellipse! It seems to me that Note 3 is about as clear as Note 2. In WORK, No. 78, I demonstrated that two elliptic curves when struck by the pin and string method were not parallel, and I will now try to make it clear why they are not, when struck with the trammel. In Fig. 2 por-

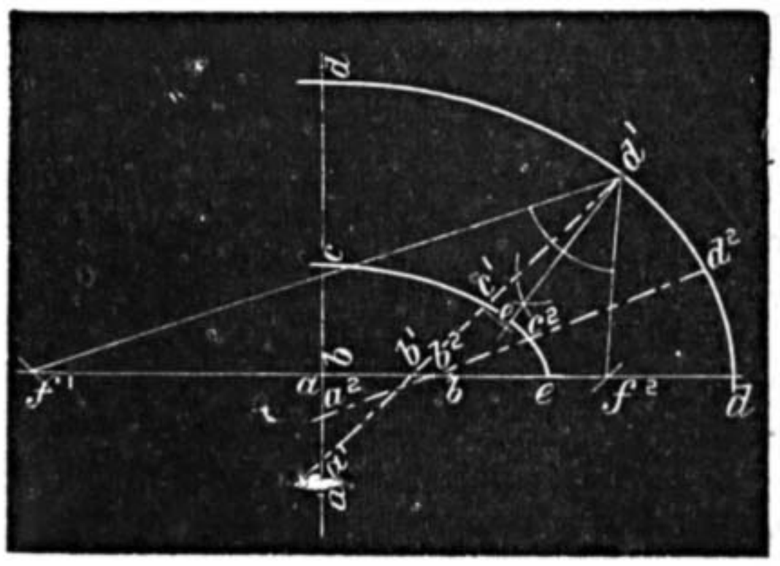

Fig. 2.—Diagram showing that two Ellipses are not parallel when struck by the Trammel.

tions of two curves are given, struck by the trammel *a*, *b*, *c*, *d*, which is shown in four positions, *a*1, *b*1, *c*1, *d*1, etc. When the trammel is at *a*, *b*, *c*, *d*, on the major or minor axis, the line *c d* is normal to both curves, but when it is at *a*1, *b*1, *c*1, *d*1, and *a*2, *b*2, *c*2, *d*2, it is not so; therefore the curves are not parallel, for if they were parallel, a normal to one curve would be normal to the other one, and all normals connecting the two curves would be equal. A normal to the outer curve is drawn at *d*1. If the curves were parallel, *d*1—*e* would equal *c d*, but a reference to the figure will show that it does not. In reply to J. W. H. (WORK, No. 91), 'I have no means of answering his question properly, as I have no elliptic chuck, but I know from works on geometry by well-known authors, and by practical trials, that if an ellipse is an oblique section of a right cylinder or cone, two ellipses cannot be parallel. I have proved practically to my own

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satisfaction by cutting a section of one of the above solids, finding the major and minor axis, then testing the curve by five of the methods used in plane geometry, such as the pin and string, trammel, two circles and points, rectangle and points, etc., that in all cases the curve is the same, and that the definition given in 'Practical, Plane and Solid Geometry' (Angel) is correct, viz.:—'That if a point moves in such a manner that its distance from a fixed point is in constant ratio to its perpendicular distance from a fixed straight line (being nearer to the point than to the line), the curve traced by the moving point is an ellipse.' If we admit this to be correct, an ellipse is a true ellipse or no ellipse at all, just the same as a straight line is a true straight line. J. W. H. will readily see by my diagram, No. 2 in the above letter, that a trammel cannot strike two parallel curves if one of them is an ellipse. If J. W. H. will turn a brass plate in the manner he describes in his letter, and send me a tracing of the four curves, it will be an easy matter to tell which (if either) is the ellipse."

Bruises in Plate.—H. S. G. writes; in reply to APPRENTICE (see page 618, Vol. II.):—"The way to remove bruises from articles of plate with narrow necks is as follows:—First for the tool: it is a simple one, and is called a snarling tool; it varies in shape and thickness, but Fig. 1 is the usual form, and as to the thickness of the iron rod it is made from, well, that will hardly be less than ¼ in., and it may well be very much thicker. For cream-jugs and such-like articles, round rod of ¼ in. to ⅜ in. should be stout enough. It is fixed in a vice, as shown in Fig. 2. The hammer is also sketched, to show about the

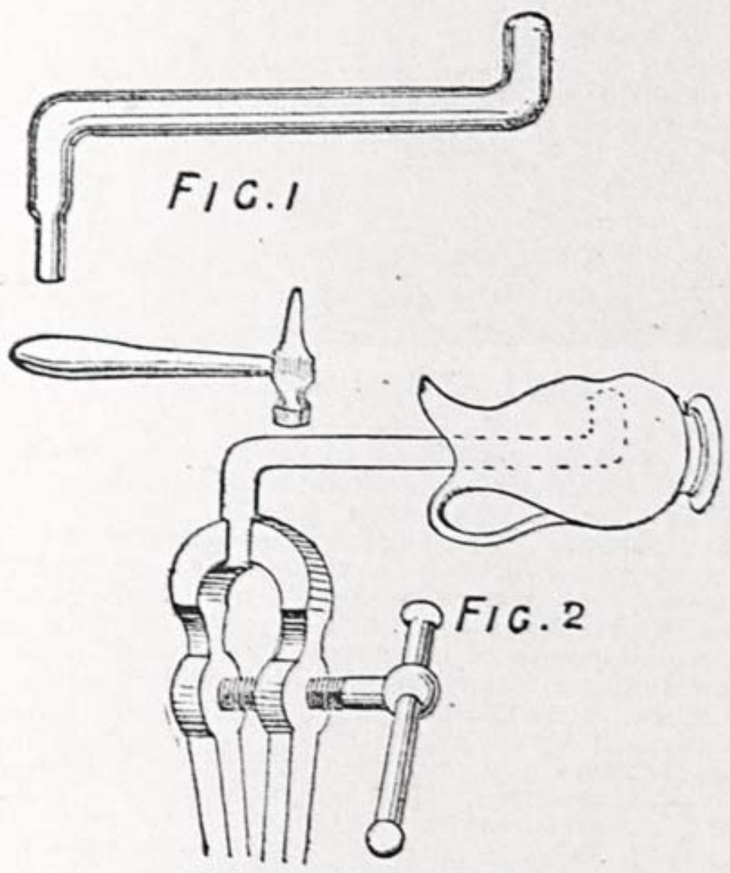

Plate-Repairing Tools.

place it should strike; it is not for the purpose of giving a direct blow, nor is the snarling tool intended to resist direct blows; but, on the contrary, it is merely the means of conveying a succession of small jars or taps to the desired spot, where a hammer or punch cannot be used. That is all I think that need be written. Practice, combined with care and observation, will enable APPRENTICE to get up dents in the most awkward places. Of course, the end of the tool that comes in contact with the work should be smooth and somewhat rounding."

Belts.—TURNER writes:—"On page 519, 'Shop,' Vol. II. of WORK, A. R. (*Scorrier*) writes on the merits of cotton and leather belts. Let me say that if A. R. will go to the slight trouble of covering the pulley of his saw-bench with leather well saturated with castor-oil, he will not have much trouble with his belt slipping."

Painting on Terra-Cotta.—C. W. B. (*London, E.C.*) writes, in reply to J. E. H. (*Southampton*) (see page 650, Vol. II.):—"J. E. H. will find no difficulty in painting flowers upon plates if he is capable of painting upon card or canvas; the same oil-tube colours are used, and the medium I find the cheapest and best instead of using megilp, which is used for canvas, is a mixture of turps, a very small quantity of gold-size, and a preponderance of best copal varnish; of course, this is only for painting when the plate is not to be afterwards fired. If water-colours are used, procure moist colours, which can be obtained of any artist's colourman, and a little gum arabic, which makes them shine, can be put in the water."

Glass Cement.—C. W. B. writes, in reply to O. H. O. (*East Dulwich*) (see page 650, Vol. II.):—"O. H. O., who requires a cement for joining metal to glass, may find the following recipe of value. A solution of 8 oz. strong glue and ¼ oz. Venice turpentine, which boil together, and stir till thoroughly mixed."

Violin Mute.—MIEUX QUE ÇA writes, in reply to VIOLIN MUTE (see page 650, Vol. II.):—"If he requires a mute for his own use, why try to make one when he can get one with an A and C pitch from any music dealer for 6d. If VIOLIN MUTE is a little boy, and cannot coax a sixpence from his father, he must do as I had to do once—get the key of the front door and place it between the third and second strings on the bridge, with that open place that we notice in almost all common door-keys pushed tightly on to the bridge. The eye of the key will sit right over tail-piece. This forms a capital mute."

Silvering Dials Dead White.—B. E. W. (*No Address*) (see page 669, Vol. II.) writes:—"ALBO may re-silver his aneroid dial by the following process:—Rub all the old lacquer and silver off with powdered bath brick. If a circular dial, care should be taken to keep a circular motion, or the work will have a scratchy appearance when finished. When clean and free from grease it is ready for silvering. Get 1 dwt. of nitric of silver, a couple of handfuls of salt, and 1 oz. of cream of tartar. Proceed as follows:—Dissolve the nitric of silver in 1 oz. of water. Keep in a bottle, as it will do for several dials; pour a small quantity in a saucer, and have the salt and cream of tartar near at hand, also a vessel with some clean water in; dip a piece of rag into the clean water and salt. Rub dial well, and use salt plentifully; dip into nitric solution and rub until required colour is produced, adding cream of tartar. The action of the salt gives the dial the affinity for the silver, and cream of tartar whitens or bleaches it. With care you can get either a blue tint or dead white. Some people use the nitric of silver crushed dry, and dip alternately into salt silver tartar, but if you are not careful, you get the silver on streaky and black; the other is far the best and easiest way. Should any of the figures be cracked, they can be filled before starting to silver with shoemaker's heelball. To finish the dial, wash and dry with clean (soft) cloth, and warm gently, either in the oven or over a Bunsen burner; care must be taken not to get it hot, or the filling in figures will smear when lacquering. You can get colourless lacquer at any oil merchant's. I get mine from Gedge, St. John's Wood, London."

Window Cleaning.—CHEMICAL writes, in reply to C. T. (*Ashton-under-Lyne*) (see page 634, Vol. II.), who asks, "What is the composition of a window-cleaning liquid?":—"It is dilute hydrochloric acid. The cleaner mixes a little of the strong acid with water in a pail, rubs it on the windows, and quickly washes it off again; if left on the windows it quickly etches them—*i.e.*, renders them dull and opaque; it cannot be kept in a glass bottle as it dissolves glass, but is sold in gutta-percha bottles. It must be carefully used, as it causes very bad sores if spilt on the hands; it rapidly clears away grease and dirt from factory windows, and that is what it is used for. I believe there is a Window-Cleaning Company in Leeds who hold a patent for the use of it for that purpose, but I may be mistaken."—H. B. B.

Vaporiser—Steamy Windows.—M. (*Bishop Auckland*) writes, in reply to J. B. (*Colchester*) (see page 670, Vol. II.):—"Carry a pipe from the top of the window to the outside, and fix on the top an extracting ventilator, such as are made by Boyle and Son, London, or Gibbs & Son, Liverpool. This will carry off the heated air, and prevent it being condensed by the cold glass."

Glass Cement.—BERTIE writes, in reply to O. H. O. (*East Dulwich*) (see page 650, Vol. II.):—"Cement for mending kerosene oil-lamps is made as follows:—Three parts of resin, one of caustic soda, and five of water. This composition is mixed with half its weight of plaster of Paris. It sets firmly in three-quarters of an hour. It is of great adhesive power, not permeable to kerosene, a low conductor of heat, and but superficially attacked by hot water."

Steamy Windows.—A. G. S. (*Edinburgh*) writes, in reply to J. B. (*Colchester*) (see page 670, Vol. II.):—"I have heard glycerine recommended. Clean the windows perfectly dry, and then rub with a clean cloth on which a few drops of glycerine have been placed. The only effectual remedy, however, is to have the windows thoroughly ventilated. Have three or four holes, ½ in. or so, bored in top and bottom of frames of the windows. That, however, means a cold and draughty place, and I would recommend J. B. to tolerate the 'terrible scourge,' the remedy being worse than the disease to my idea."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—W. W. (*Caverton*); AMICUS; RING MANDRILL; A READER; A. R. (*Somerton*); I. R.; NIL DESPERANDUM; PHONO; DRY PLATE; E. R. (*Chelmsford*); W. P. B. (*Colnbrook*); H. S. (*Milnsbridge*); APPRENTICE; J. G. (*Rochdale*); T. R. B. (*Blaydon-on-Tyne*); OLD BRUIN; E. H. H. (*Chatham*); CARTER; T. S. (*Poplar, E.*); E. G. P. (*Kingsland, N.E.*); W. P. (*Lonsdale*); J. S. (*Londonderry*); SIFTER; J. R. (*Helmshore*); J. D. (*Glasgow*); J. H. (*Wigan*); T. C. (*Manchester*); L. G. (*Middleton*); J. R. (*Middlesbrough*); J. S. (*Huddersfield*); S. P. (*South Wales*); J. G. (*Nottingham*); S. C. (*Ashton-under-Lyne*); J. S. (*Nelson*); CONSTANT READER; J. B. (*Durham*); J. W. B. (*Birkdale, near Southport*); E. K. (*London, N.*) LEARNER; X. Z. (*Leeds*); A YOUNG BEGINNER; G. F. (*London, E.*); RENFREW; J. S. H. (*Dublin*); A. O. (*Manchester*); J. H. (*Hexham*); W. J. E.; D. G. T. (*Ilminster*); H. C. S. (*Ipswich*); GLASS PAINTER; GRAPHO; F. G. (*London, N.*); P. T. (*Kilmarnock*); CHEST; SOWERBY; A READER; D. S. M. (*Glasgow*); E. W. C. (*New Wandsworth*) PENYBRYN; A. H. W. (*London, W.*); R. W. M. (*Kildare*); MIEUX QUE ÇA; SAW MILL; T. B. (*Morpeth*); J. W. H. A. (*Weybridge*); CYCLOS; A BLACKSMITH; B. F. (*Liverpool*); YOUNG ASPIRANT; H. B. T. (*Hendon*); A. R. (*Scorrier*); DISTANCEPHONE; A. A. B. (*Brighton*); H. B. (*Dudley*); W. A. F. S. (*London, S.W.*); W. A. (*Chatham*); T. L. (*Gainsboro'*); CYMRO; OIL PAPER; W. R. (*Cheshire*); H. S. (*London, N.W.*); T. G. S. (*High Wycombe*); OLD NORWICH; W. N. (*Tottington*); R. N. (*Grays*); F. C. (*Leytonstone*); READER; F. T. D. (*Stoke Newington*); OMAR; T. H. B. (*Ardwick*); G. F. (*Liverpool*); E. W. (*Worcester*); A SUBSCRIBER TO "WORK"; G. F. R. (*Woolwich*); CORBEX; G. P. (*Elgin*); W. J. P. (*Wimbledon*); D. J. (*London*); W. C. (*Peckham, S.E.*); A. B. X. (*Guildford*); BUSYBODY; W. N. (*Cheshire*).

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THE Manufacture of the Medals and other arrangements in connection with the Prize Distribution are now in a forward condition, and the Editor hopes to announce in an early number the date and place at which the Distribution will take place.

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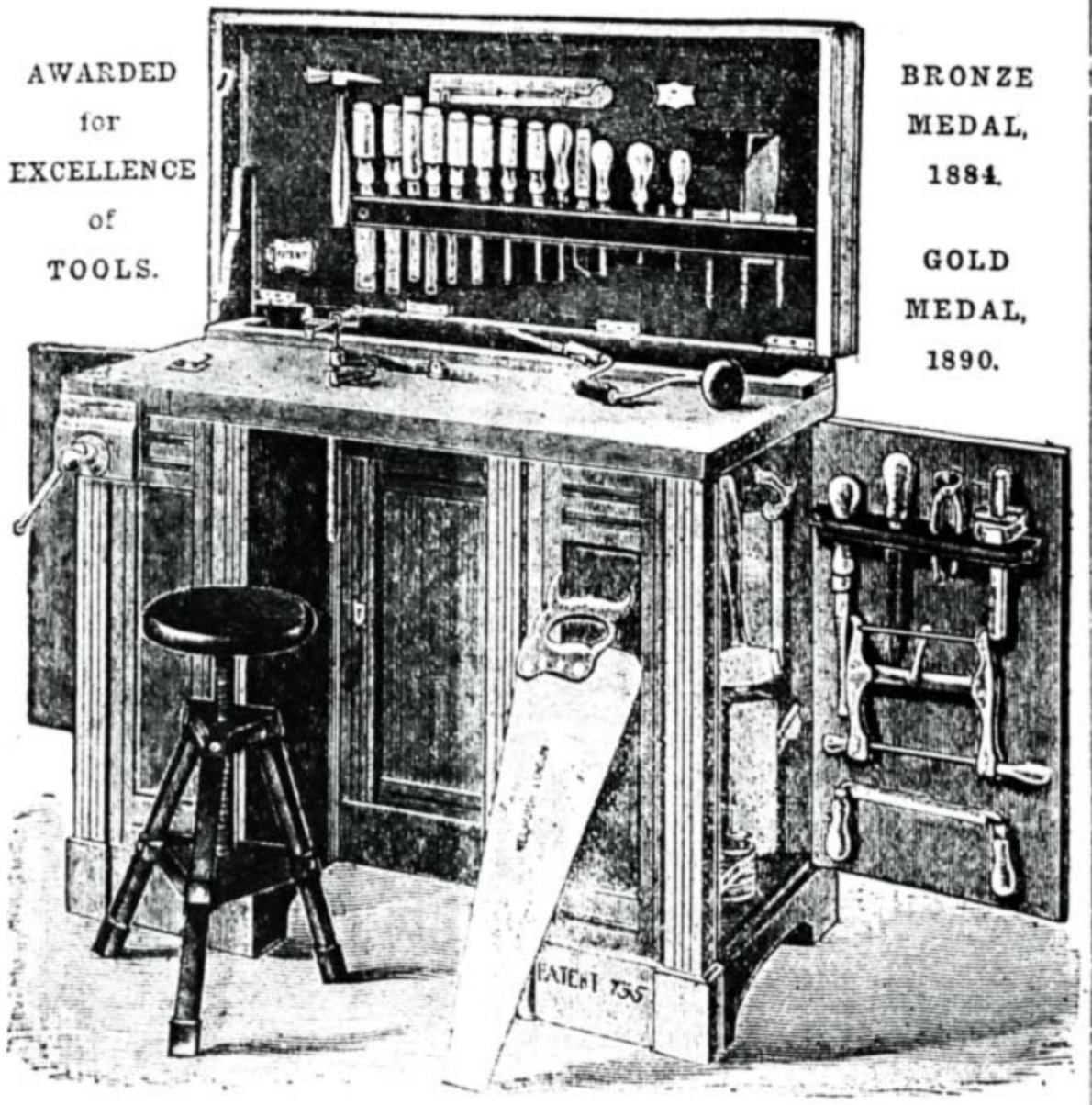

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